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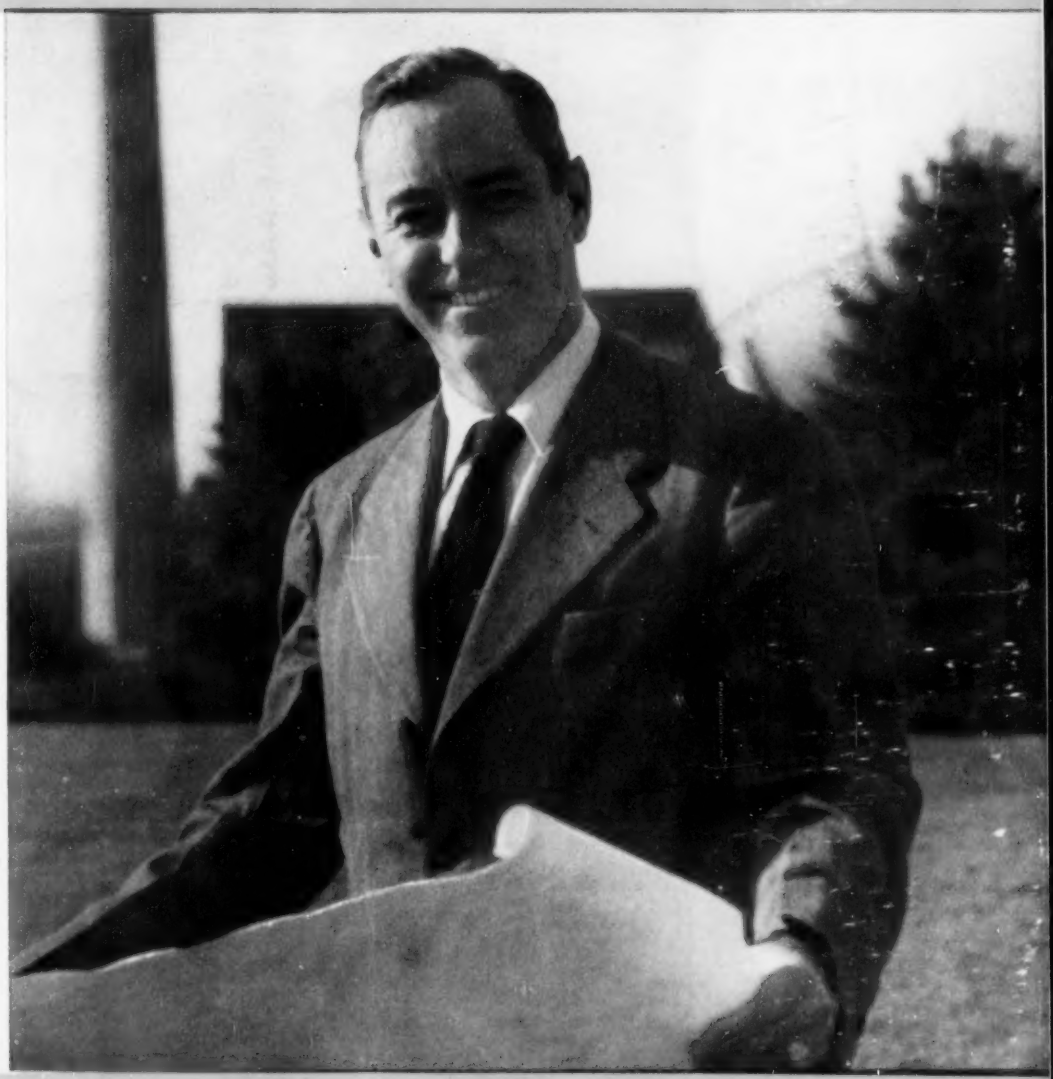
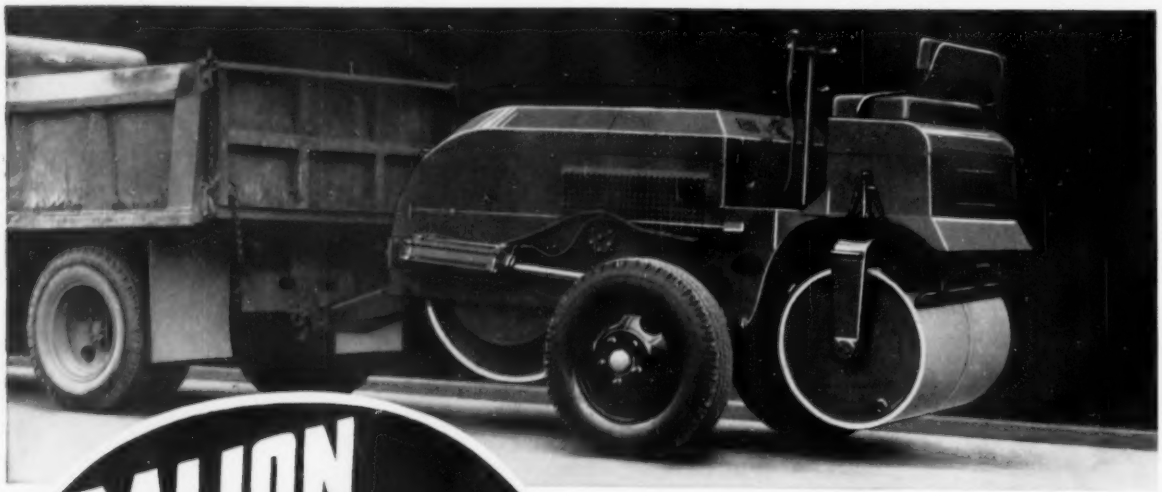
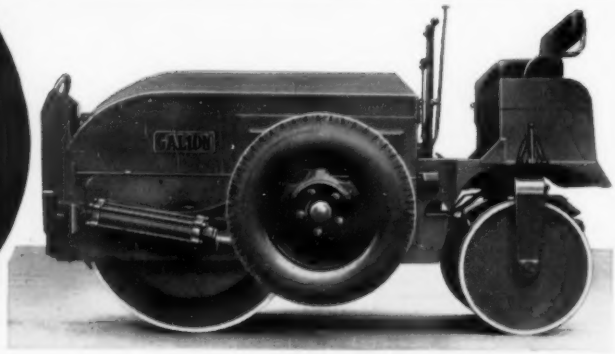


John McDonald, Chief Engineer of the Board of Public Works, Springfield, Mass., checks plans and site for an incinerator. More on page 30.



GALION 4 TO 6 TON PORTABLE TANDEM ROLLER *with retractable wheels*



FEATURES

- Hydraulic jack (engine-operated) in towing hitch.
- Hydraulically-retractable, roller bearing, rubber-tire transport wheels.
- Hydraulic steering — easy to operate.
- Rugged spur gear drive.
- Constant mesh transmission.
- Variable weight — 144 lbs. up to 206 lbs. compaction pressure per inch of roll width.
- Large diameter compression roll for better compaction.
- Ample power — 25 h.p. air-cooled gasoline engine.

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Speedy and easy raising of the COMPLETE roller unit off the ground is accomplished by simple finger-tip hydraulic control. Built-in hydraulic jack in truck hitch raises compression roll, and retractable transport wheels raise the steering roll.

Saves valuable working hours to and from the smaller compaction jobs.

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BARMINUTOR*

A New Comminution Development

CHICAGO SEWAGE EQUIPMENT

Barminutor installed in 5′ channel.

The Barminutor Model "A" exclusively provides the advantages of comminution with maximum economy for flows from 10 to 15 M.G.D. Screening and cutting of coarse sewage material is accomplished without removal from the flow, maintaining continuous cleaning of the screen. The Barminutor, developed and tested over five years, based on fifteen years successful experience with the Comminutor, eliminates odors and handling nuisance in the screening process. High rate cutting in the flow—comminution—provides low maintenance cost and long life for cutting parts.

In tests conducted on a Barminutor installed at the Indianapolis, Indiana Sewage Treatment Plant, the unit was subjected to test loads of screenings up to six times normal load for 40 M.G.D. This material was comminuted and the screen completely cleaned in six minutes. Even with this heavy load head loss through the screen did not exceed 6". Like the Comminutor, power requirements are low.

FUNCTION OF THE BARMINUTOR

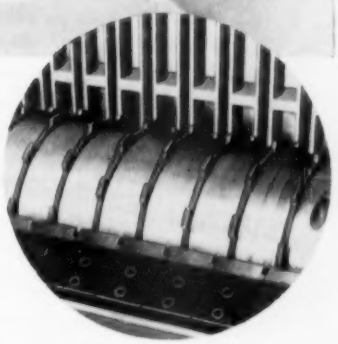
1. Cleaning the ¾" vertical bar screen and cutting of the screenings is accomplished by continual travel of the comminuting unit at 8 ft. per minute. Both upward and downward travel is controlled by an electric reversing brake motor.

2. The cutters on the comminuting unit, rotating at 400 R.P.M., travel within slots of the U-shaped bars and carry coarse material to the combs for cutting.

3. The direction of rotation automatically reverses when the direction of travel changes. The combs automatically position themselves to accomplish rapid cutting for each direction of rotation.

4. Uncuttable material is automatically rejected without damage to the cutting parts.

5. Rotation of cutters, position of combs and rejection of uncuttable material is accomplished through oil powered hydraulic system.



Close-up of Cutters and Combs. Cutters rotate within slots of Bar and Comb.

**Chicago Pump Company's trade name for its new screening and comminuting device for large sewage flows from 10 M.G.D.*

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SEWAGE EQUIPMENT DIVISION

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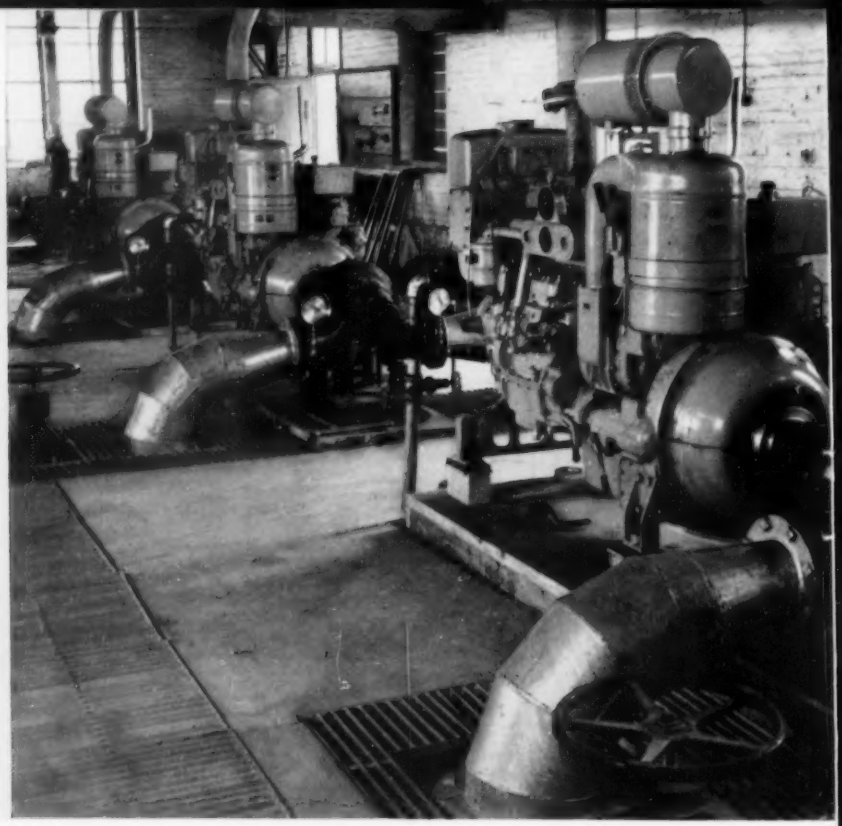
People sleep soundly in Pueblo



. . . thanks to CAT* standby power

Pueblo, Colorado, may need power in a hurry some day. If it does, nobody's worrying about the water supply. That's protected by the most reliable standby power available—Caterpillar power. Three D337 Engines, in the Public Water Works plant, District No. 2, are ready to swing into action to keep the 2350-gallon-per-minute 8″ x 8″ pumps running!

Why did Pueblo install Caterpillar Diesels? Here's the answer from Superintendent Fred B. Dunlap: "We had evidence of Caterpillar dependability in our D2 Tractor, which we've used for a long time. And the D337s fitted our specifications exactly, so we bought them."

Performance records in municipal plants all over the country back up Mr. Dunlap's judgment. Besides reliability, these rugged yellow units offer many other advantages. For example: Easy, low-cost installation. They take up little space and don't require big concrete bases or expensive wall or overhead construction. Easy to operate and maintain, they don't need the attention of high-salaried personnel. And they burn low-cost No. 2 furnace oil without fouling—another saving. What's more, they're *honestly* rated. The power they promise in the specification sheets is the working power you can count on in your plant!

What are your needs? You'll find exactly the right unit, or combination of units, in the Caterpillar line—engines and electric sets in 12 sizes up to 500 HP and 315 KW. Your local Caterpillar Dealer is a source of prompt service any time of the day or night. Ask him to show you proof of performance!

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PUBLIC WORKS MAGAZINE

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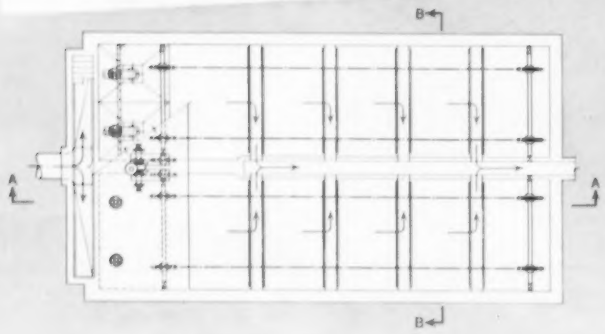
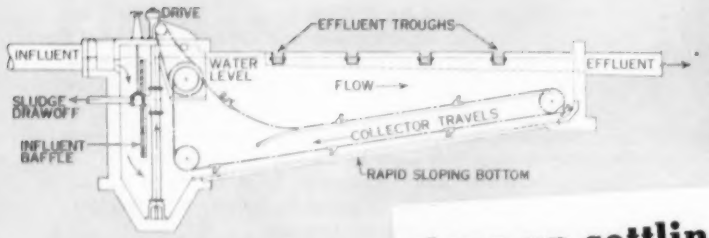
THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES

New UNIFLOW settling tank





Link-Belt's new UNIFLOW settling tank can be utilized for economical removal of solids from water, sewage or industrial liquids. Uniflow tanks are equipped with Link-Belt Straight-line Sludge Collectors which will remove sludge from the tank floor and scum from the surface.

steps up settling efficiencies . . cuts construction costs

LINK-BELT development offers new economies for water, sewage and industrial liquids treatment

WITH its rapidly sloping bottom and multiple effluent weirs, Link-Belt's new UNIFLOW settling tank represents a big design advance. These, combined with the decreasing cross sectional area, provide *uniform velocity throughout the tank.*

Result: Better settling conditions . . . low overflow rate . . . uniform discharge from a large area of the tank surface. In fact, on one New England experimental installation, UNIFLOW gave practically the same efficiency in B.O.D. and suspended solids removal as a conventional tank with one-third more volume.

The new economies possible with UNIFLOW are typical of the development work constantly under way at Link-Belt. If you have a water, sewage or industrial waste problem, our engineers will work with your engineers, chemists and consultants. They'll help you get the finest in modern treatment equipment.

Primary and final settling tanks at a small treatment plant are of the UNIFLOW design.

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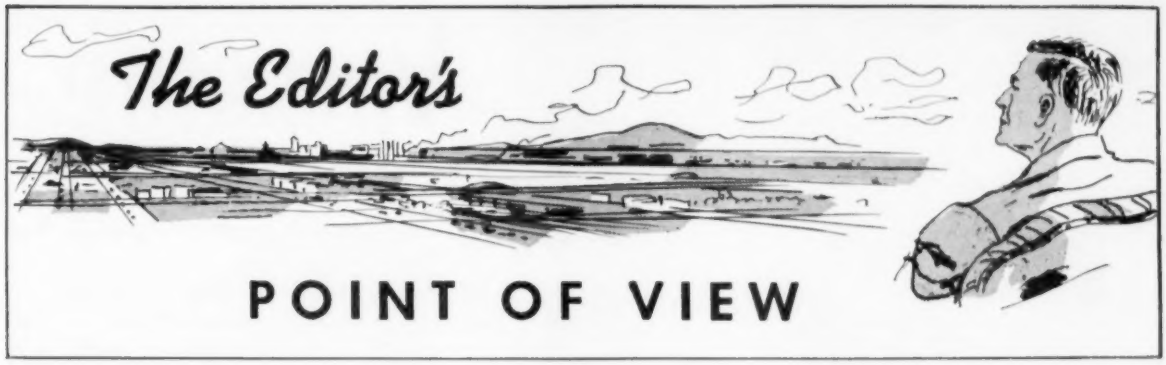
LINK-BELT

SANITARY ENGINEERING EQUIPMENT



The Essence of Engineering Is Change and Improvement

IT MUST have been a cause for a great deal of mental stress to some engineers of a hundred years ago when they were asked to discard the good old water pipe made of bored wooden logs and approve the installation of that new-fangled cast iron pipe. In just the same way, many engineers to-day are finding it hard to look with any degree of favor on new ideas—and by new we mean anything not current thirty or forty years ago. Yet the very nature of engineering is such that change and improvement are the essence of its usefulness to society. Experience and training, instead of hardening a man into an ancient mold, should equip him all the better to see the opportunities in, and the benefits of, new methods, new equipment and new procedures; and it should give him the background to devise, adapt and develop better ways to meet our modern conditions. An engineer should not often say "no" to suggestions for new ways to solve his problems; rather he should listen, consider, think—and then usually he should be able to make a wise suggestion or two and say "Let's Go."

The Problem of Civil Defense is Still With Every Community

THOUGH perhaps the terrible urgency is no longer in the minds of many so far as civil defense is concerned, its needs, nevertheless, are still with us. For that reason we shall, next month, as for the past several years, publish an issue in which some stress is laid on that important subject. As applicable to the emergencies of ordinary days as to wartime disasters, civil defense covers a wide range of activity. Pick up a paper almost any day and read of a disaster in some part of this country, perhaps minor as compared to what might happen in war-time, but a disaster to someone. Almost invariably property damage, and often loss of life, have occurred far in excess of what might have been suffered with a properly organized civil defense-emergency agency on the job.

When a man is faced with a major decision he is better able to decide wisely for having made decisions, even minor ones, of a sound nature previously; and if a community should be faced with a major disaster, whether in peace or in war, it will be immeasurably better off for having in operation an agency trained in thinking and in acting in previous emergencies. Moreover, as we have often emphasized, most of the things that are needed in civil defense are simply good peace-time housekeeping procedures that ought to have been done before.

Extra Lanes for Uphill Roads for Better Health

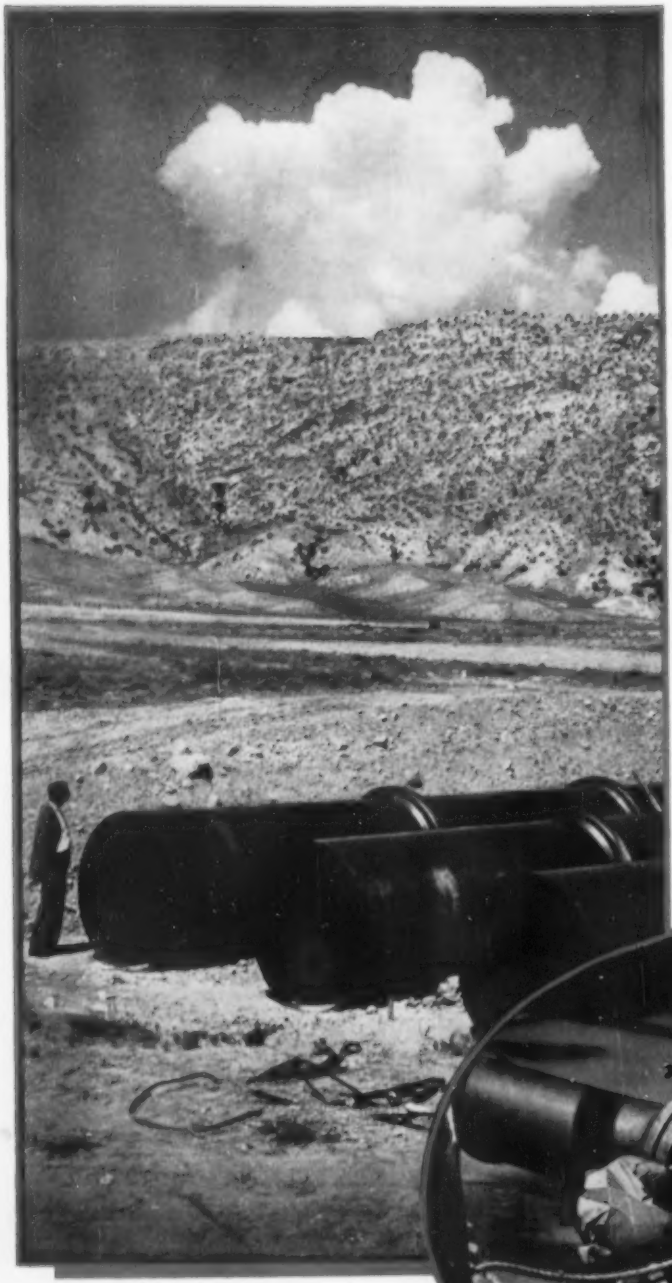
FRUSTRATED motorists crawling uphill at 5 mph behind huge trailer trucks are finding relief on important routes in Alabama and some other states. There third lanes are added on the uphill side for trucks and other slow-moving vehicles, leaving the regular lanes free for faster-paced ones. First results are in greater safety: fewer head-on collisions as impatient drivers "take a chance" in their irritation at the creeping monsters ahead of them and swing out into the path of oncoming cars from over the hill. A second is a lowering of the general blood pressure level of an exasperated public; always an admirable health measure, as well as a good public relations one.

From the money angle, nothing could lessen the pressure for four-lane roads where they are not generally needed like this simple and not too-costly palliative of a third lane on the right hand side of hill-climbing highways where *it* is needed.

In view of the widespread prevalence of truck use, even counties might consider this procedure. If any have done so, we will be glad to hear from them.

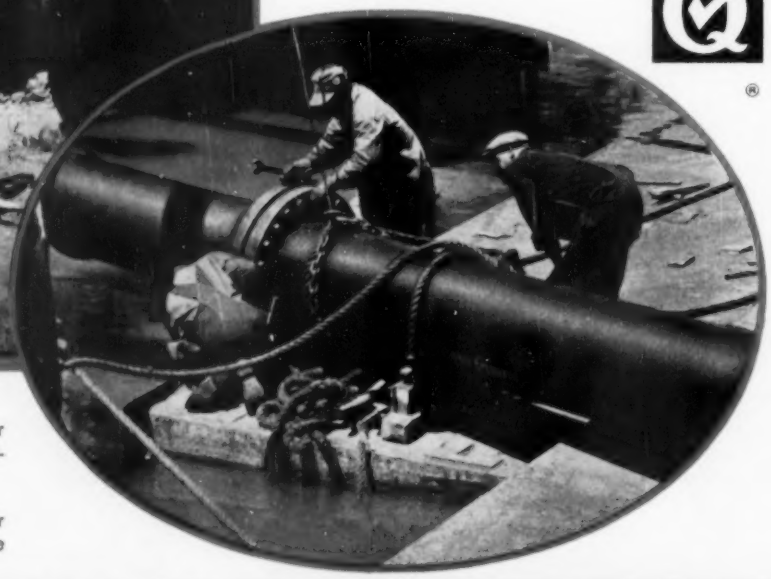
More Light Means Less Crime

DID you ever strike a light some dark night in a backwoods cabin and see the bugs start scurrying for their hiding places? That is what happens when cities have adequate street lighting. The human termites who prey on our citizens cannot stand light. That is only one of the good reasons for overhauling and modernizing the antiquated street lighting equipment that so many of our cities still have.



Versatile-

You know, of course, that cast iron pipe is widely used for water and gas mains, pressure sewers and outfalls, and almost exclusively in water filtration and sewage treatment plants. It is not so well known that this versatile pipe is also rendering yeoman service to Industry in keeping down maintenance cost in many applications. Such industries, for example, as chemical, paper, rayon and other process industries; coal mines and oil refineries; railroads and steel plants. Where effective resistance to corrosion is mandatory for long life and economy, specify cast iron pipe. For information write: Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3, Ill.



1800 feet of 36" to 60" cast iron pipe for culvert in connection with relocation of railroad tracks in Wyoming

(At right) A river-crossing cast iron water line near Chester, Pa., showing flexible joint assembly.

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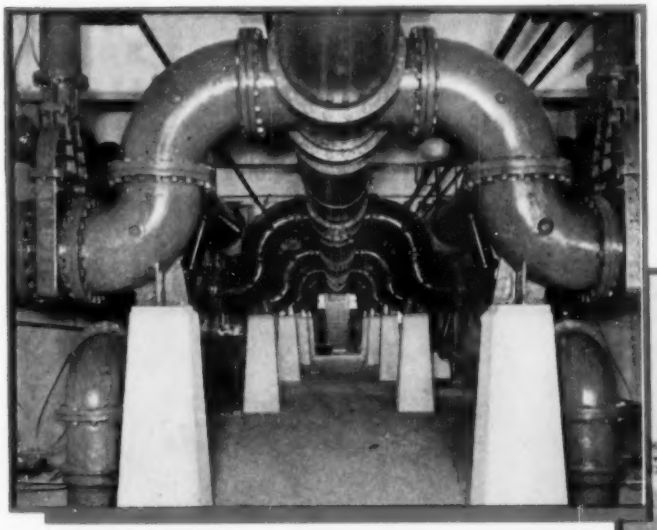
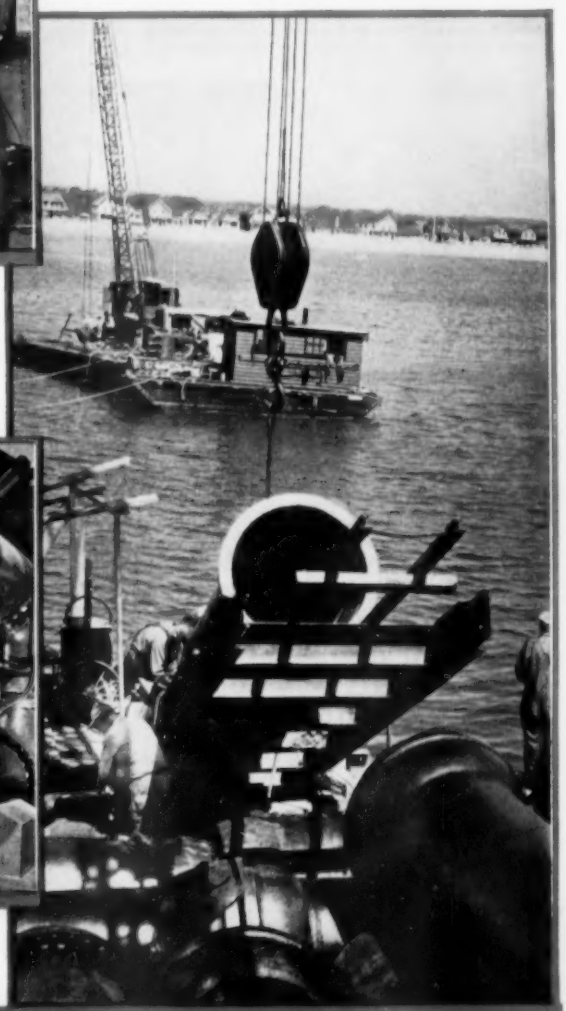
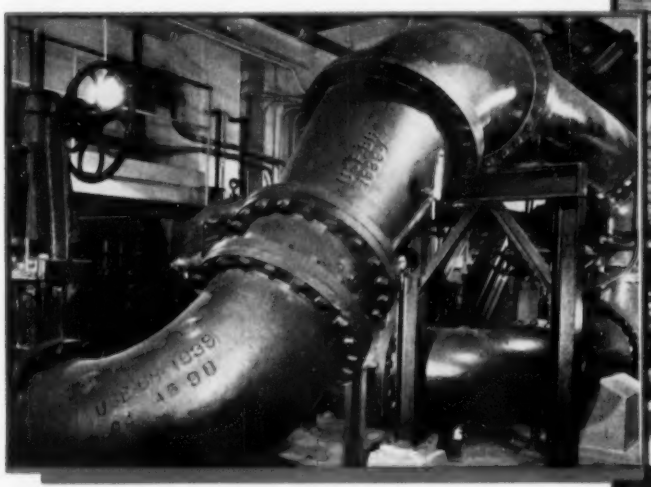


Cast iron pipe and fittings installed in gallery of water filtration plant in Muskegon, Michigan.



Submarine installation of cast iron flexible joint pipe for outfall sewer into Long Island Sound at Fairfield, Conn.



Installation of cast iron pipe and fittings in steam plant of a gas and electric utility in California.

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9 ft., ¼ in.	11 ft., 4 in.	12 ft., 8 in.	Dumping height*
			13 ft., 5 in.

*Height of bucket hinge

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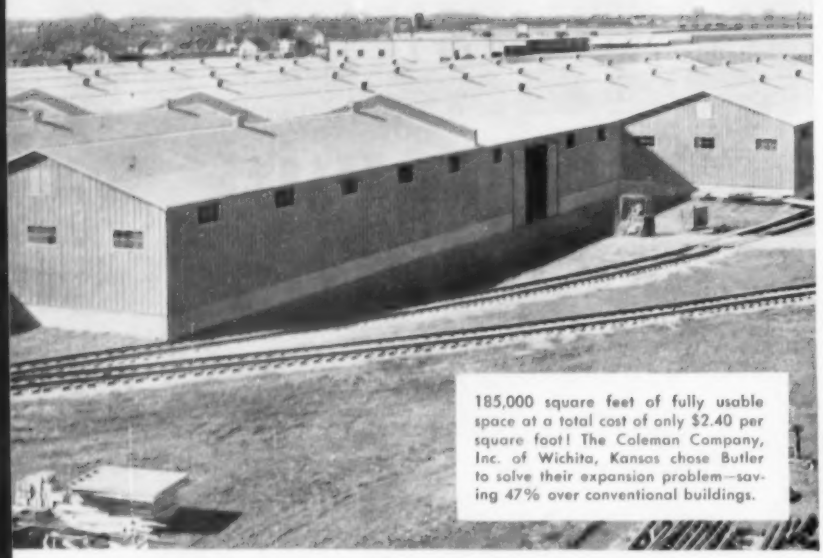


185,000 square feet of fully usable space at a total cost of only $2.40 per square foot! The Coleman Company, Inc. of Wichita, Kansas chose Butler to solve their expansion problem—saving 47% over conventional buildings.

Build for life...build for less with BUTLER steel buildings

Engineered to modern management needs in a rapidly changing economy—that's why Butler steel buildings give you *more* than mere shelter and workspace. They are a *new* profit-tool for management! Butler's versatile buildings can be modified to new purposes, new installations, new plant layouts—or moved to new locations—quickly and inexpensively. They can be erected in one-half the time required for commonly used materials. Butler buildings equal or exceed conventional structures—in unobstructed clear-span interiors—in snug weather-tight protection for extremes of heat and cold—in appealing good looks, and unbeatable economy!

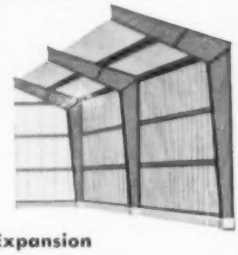
Yes, you build better *for less.* The Coleman Company economy story illustrated above is a common experience of Butler customers. Savings on the original financing—or investment of reserves, will make a real difference in the profit position of your organization from the very start. Lower maintenance costs and depreciation of Butler galvanized or aluminum sheeting will pay you an extra yearly dividend.

Butler buildings are an important part of your profit picture. Write today for full details and the name of your nearest Butler dealer.

Here is why BUTLER is a better buy

Every Foot of Floor Space is Usable

There are no interior posts or columns to waste space and create work-slowing "bottlenecks." Rigid-frame construction also shrinks maintenance costs . . . extends building life.



Fast Erection . . . Easy Expansion

Precision-punched and dimensioned bolt holes speed erection—simplify expansion or dismantling and moving. Galvanized bolts, with Neoprene rubber washers, lock deep-corrugated sheets firmly to the sturdy frame.

Weatherproof Protection

The one-piece, die-formed roof ridge eliminates ridge roll—helps to make the building leakproof and weather-tight.

Triple-Strength Corrugated Sheets

Butler sheeting with deep-formed corrugations on 12-inch centers, is three times as strong as ordinary corrugated sheets. Overlapping corrugations bolt tightly together for maximum strength and weather protection. Your choice of steel or aluminum sheeting.

Attractive Curved Eaves

The neat, die-formed eaves—which bolt to the roof sheets—add to the appearance of Butler steel buildings...increase the strength of the eaves . . . help insure weather-tightness.

Weather-sealed Windows and Base

Where corrugated sheets meet windows or the foundation, they are tightly crimped for a snug fit that keeps out snow, moisture and rodents.

BUTLER STEEL PRODUCTS

BUTLER MANUFACTURING COMPANY

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921A Sixth Avenue, S. E., Minneapolis 14, Minnesota
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Manufacturers of Oil Equipment • Steel Buildings • Farm Equipment • Cleaners Equipment • Special Products

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Check these Profit making Features of the NEW...

DEMPSTER DIGGSTER GRD-101

✓ **NEEDS NO WHEEL TRACTION**
Loading of the bucket is accomplished by the exclusive Hydraulic Crowd and Hoist power of the Dempster-Diggster.

✓ **MAXIMUM DUMPING HEIGHT**
This is important because the Dempster-Diggster has the digging height capacity to handle jobs oftentimes expected only of power shovels. The dumping height is 9'6" and the digging height is approximately 15 feet. This enables the Dempster-Diggster to work with high dump equipment.

✓ **TORQUE CONVERTER**
Excavating shovels and front end loaders have to take the abuse and punishment of intermittent jolts. The Dempster-Diggster is constructed and built, not only to accept this at its full value, but to smooth out the sudden jerking and jolting by means of a torque converter. The torque converter is a mechanical feature, but its effect on greater efficiency of the machine and lower operating costs is so great it is one of the important reasons why you want a Dempster-Diggster!

✓ **MINIMUM TURNING RADIUS**
The outside turning radius of the Dempster-Diggster is only 18'3".

✓ **ELECTRIC BUCKET TRIP**
You get a machine with an automatic electric bucket trip for dumping drop bottom digging bucket . . . giving you instant dumping and instant closing of bucket.

✓ **TRUCK-SPEED MOBILITY**
Dempster-Diggster moves from job to job without the use of hauling equipment or can be towed behind a dump truck with the use of a tow bar.

✓ **HYDRAULICALLY STEERED**
Your Dempster-Diggster has positive hydraulic steering booster which is operated by separate, individually driven pumps. Your operator stays fresh, will not tire with this finger-tip steering.

Here's a shovel that won't skim the bank or bottom—but gets a full bucket with every stroke. Here's a shovel that gives you the extra speed on the job and to and from jobs that means extra profits to you! Pound for pound, dollar for dollar, the Dempster-Diggster will out-dig and out-load any other available competing machine in tough going! Let us prove that statement! Write for complete information, including Folder No. 3116.

You get a truck payload with a Dempster-Diggster. Note truck is loaded to maximum heaped capacity, yet Dempster-Diggster has ample clearance.

Photo above shows bucket against front of frame in the position which enables Dempster-Diggster to dig 15 inches below grade.

DEMPSTER BROTHERS, 934 Dempster Bldg., Knoxville 17, Tennessee

Now's the time to mail this month's Reader's Service card.

Another machine has been added to the "KOEHRING Work Capacity" team

NEW KOEHRING 15-TON ½-yd. 205

LIFTS 15 TONS on rubber
With its maximum 15-ton lift capacity, this new Koehring 205 Truck Crane brings you a big *plus* in work capacity at "½-yd." price.

LIFTS 10 TONS on crawlers
As a crawler crane, heavy-duty 205 has 10-ton capacity . . . and boom lengths from 30 to 50 feet.

½ TO ¾-YARD clamshell or dragline
Extra work capacity lets you handle ½ to ¾-yd. clamshell or dragline buckets on wide work range.

½-YARD dipper capacity
This 205 is also available as ½-yd. shovel or hoe. Hoe digs 17¾ feet deep . . . up to 32 inches wide.

WITH ANY ATTACHMENT HERE'S WHAT YOU GET:

- On rubber-tired mounting, 32½ m.p.h. travel speeds.
- On standard or extra-long crawlers, 16, 20 or 24" shoes.
- Automatic traction brakes on crawlers.
- Only 2 major shafts in upper machinery.
- Antifriction power flow for dig, lift, swing, and travel.
- 4 separate adjustable hook-rollers.
- Big 20" clutches, self-adjusting.

Before you invest in any excavator or crane, see your Koehring distributor about this new 205, or write us.

R483 PW

To: KOEHRING CO., Milwaukee 16, Wis.
Send us bulletin on the new ½-yard, 15-ton 205.

NAME ..... TITLE .....
DIVISION .....
STREET .....
CITY ..... STATE .....

KOEHRING
COMPANY • Milwaukee 16, Wis.
Subsidiaries: PARSONS • KWIK-MIX • JOHNSON

Get full details of this month's products . . . mail your Readers' Service card today.

UP FRONT FOR ADEQUATE ROADS

BY
LEO J. RITTER, JR.
New York University

Highway Research Board — We attended part of the 33rd annual meeting of the Highway Research Board in Washington in January and enjoyed it very much, as usual. Didn't get to many different sessions, since the group attending the meeting has grown so large that separate sessions are held at the same time in several different buildings located in the same general section of the city. This makes things a little difficult for characters like us, who have a wide variety of interests and are addicted to popping in and out of various meetings. In addition to the opening general session, separate sessions were devoted (morning, afternoon and night) to discussions of research developments in design, economics, finance and administration, traffic and operations, materials and construction, soils maintenance and night visibility. This is a real working meeting, with the only general social event of consequence being the cocktail party sponsored by the generous and amiable folks of the Calcium Chloride Institute. Most of the papers we heard were about soils; two good papers were given by Harry Seed of the University of California about compaction and related effects. Interest in compaction remains at a high level, particularly in the vibratory compaction of granular soils and base materials. One of the groups conducting research along these lines is the Naval Research Laboratory at Port Hueneme, California; work there is under the direction of J. A. Bishop. A real, old-fashioned hassle developed at one of the soil sessions following a paper by W. S. Housel attacking the use of vertical sand drains on a particular project; one of the debaters was O. J. Porter, generally regarded as the father of this type of construction. The meeting was fun and we are already looking forward to next year.

Winter Driving — Our trip to Washington for the HRB meeting was made in the old family bus. We left New York the morning after old man winter had dumped 9 inches of snow on the metropolitan area. To our pleasant surprise the New Jersey Turnpike was in good shape, although the 35-mile speed limit was in effect. It wasn't until we hit Aberdeen, Maryland that we ran into any real trouble with snow and ice. From then on and in Washington itself the roads and streets were a mess, even though there had been only about four inches of snow. Guess those people just aren't prepared to do a real job of snow and ice control. In fact, in D. C. they had their emergency rules in effect for about 24 hours, when private traffic was practically banned from the downtown area. All in all, authorities in New York and the surrounding area did a wonderful job of making principal streets and highways passable quickly. It is estimated that a major snow storm costs New York City about $100,000 an inch in direct costs of snow removal and ice control. The city budget obviously won't stand too many major snows in the same year.

Information About Traffic Engineering — An excellent source of information which may be of value in solving traffic problems in your community is the Insurance Industry Committee on Motor Vehicle Accidents, 60 John Street, New York 38, N. Y. This group (or the parent group, the Association of Casualty and Surety Companies) publishes the Traffic Engineers Handbook, the Manual of Traffic Engineering Studies, and a series of case histories entitled "Getting Results Through Traffic Engineering". It is my understanding that this group also is, under certain circumstances, offering free consulting service to small governmental units. Man to write to is Robert J. Allen, Chief Traffic Engineer.

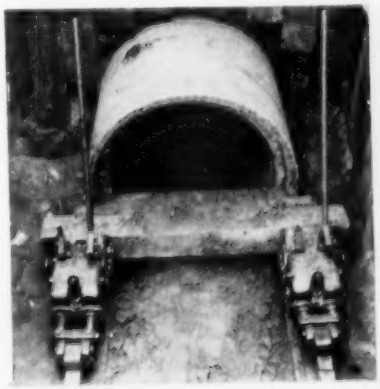
A.A.S.H.O. Test Road — The pro-

(*Continued on page* 142)

FAST, EASY WAY
TO INSTALL PIPE...
AT LOWER COST

PUSH PIPE UNDERGROUND WITH A GREENLEE HYDRAULIC PUSHER

Here's the simple, cost-cutting way to install underground pipe. Speed your jobs with a GREENLEE Pusher. One-man-operated, portable, simple to operate. No tearing up of pavement . . . eliminates extensive ditching, tunneling, backfilling, tamping, repaving. Cuts job time to a fraction. GREENLEE Hydraulic Pipe Pusher often pays for itself on first job. Two sizes — model shown above for pushing 3/4" to 4" pipe. Larger unit, below, for pipe over 4", concrete sewer pipe and large drainage ducts. Power pump (as shown above) also available for extra ease and speed of operation.



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Adjustable VALVE BOXES

TWO PIECE

sliding or screw type cast iron valve boxes for covering 4" through 10" valves for water or gas. Rugged construction for lifetime service. 5¼" shaft. Extensions as required.

THREE PIECE

valve boxes supplied with separate bases are available in sliding or screw type. Made with 5¼" and 7" shafts with extensions as required. Also, a complete line of service and roadway Boxes.

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for the finest in Water Purification and Sewage Plant Equipment

Filter Operating Tables

Leopold Operating Tables are available in a number of standard models to meet a wide range of requirements. In cases where special features are needed, a Leopold representative will be glad to assist in the design and selection of equipment best suited for the particular installation.

Write for Bul. No. 453

F. B. LEOPOLD CO., INC.
2413 W. Carson Street, Pittsburgh 4, Pa.

People, Ideas and Events

BY "DOC" SYMONS

H.T.M.A. — And before I forget it, there's one prediction I forgot to make for 1954—The American Water Works Assn. will pass the 10,000 mark in membership some time in July. It may drop below that in January, next, but from then on it'll be in five figures.

★ ★ ★

I Read Somewhere — That Process Engineers, Inc., has moved its offices from San Francisco to larger quarters in San Mateo, Calif.

★ ★ ★

Now I Know — A letter from Dr. Jim Lackey, Prof. of San. Biology, University of Florida, Gainesville, answered my question in the January issue. "Jim" says the reason the Red Sea is red is because of a *blue-green* algae, named *Trichodesmium*, which is olive brown or reddish in color.—Now you know, too!

★ ★ ★

Luminous Quote — "Collection of statistical data is like the collection of garbage; unless you do something with it, it's no good."—Will Rogers.

★ ★ ★

Profession's Loss — Last August I wrote in "People, Ideas and Events" about Dr. J. J. McCarthy, longtime chemist of the Racine, Wis. Water Dept. I said I hoped to spend a whole day sometime, listening to Mac's amusing stories connected with his work.—It is too late, now; Mac passed away early this year leaving a great gap in our profession.

One last story, which I am sure Mac will permit me.—It seems he went to a doctor, who decided Mac needed an injection of some sort. So the doctor went to the faucet, filled a small beaker, added a powder, stirred the solution, filled a small syringe and said, "Roll up your sleeve, Mac."

Whereupon Mac remonstrated, "You're not going to inject me with ordinary tap water?"

"Well", said the doctor, "you said our water is sterile—and any thing you say, is good enough for me."

★ ★ ★

Well known to the water works profession, too, was the late Croxton Morris, Vice Pres. and General Manager of *Public Works Magazine*, whose untimely passing in December, likewise leaves a loss among his friends and associates.

★ ★ ★

At the annual Mid-Winter Luncheon of the N. Y. Section of AWWA, John H. Murdock, Vice Pres. and Counsel of the Amer. Water Works Service Co., Philadelphia, looked back on his long association with the water works industry and decided he was proud to have been connected with water works men and the profession. John also said he thought our generation was leaving a lot of unanswered questions for the young men coming along.

Among the many questions left for the newcomers to answer are these:

How to develop a technique for learning what water works customers really want?

How to define the terms, enough, sufficient, and adequate in relation to water supply?

Do we have the final answer for methods and materials for water distribution?

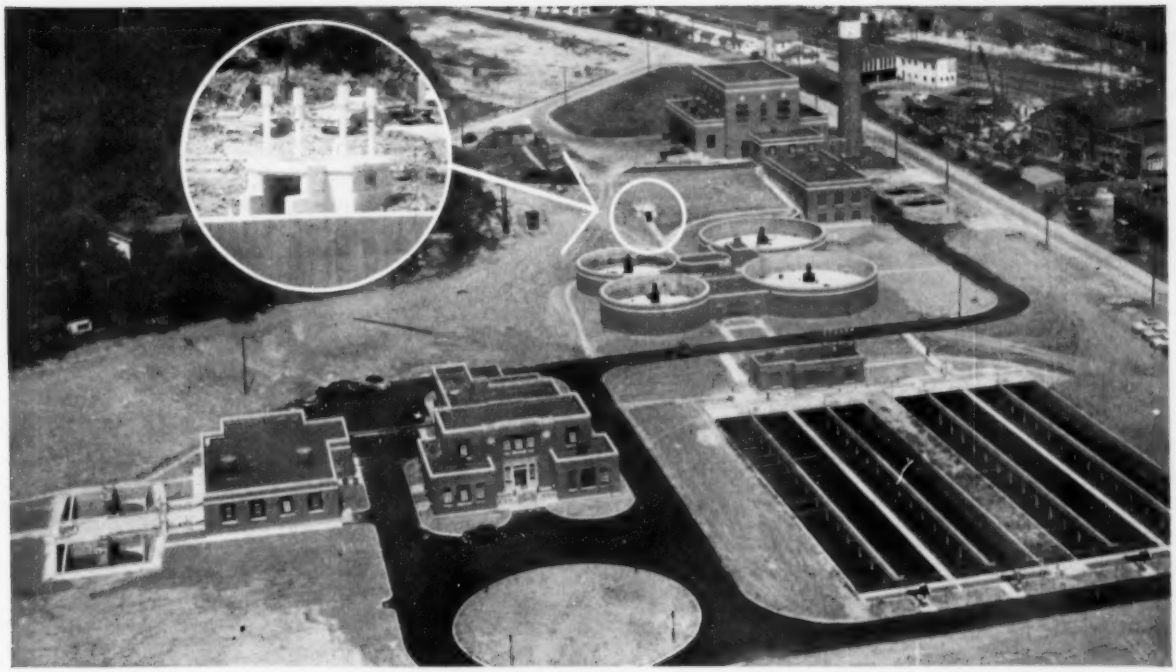
Why does the ratio of operating expenses to income stay level as customers are added when prices are stable, but rise when prices are rising?

Is it possible to develop an economic yardstick of efficiency for water works?

★ ★ ★

How many of you fellows, who attended the FSIWA meeting in

(*Continued on page* 145)



At Arlington County, Virginia . . .

capacity increased—operations simplified

WITH P.F.T. FLOATING COVERS

In 1953, fast growing Arlington County expanded its capacity in a *practical* way by:

(1) converting its two 50′ tanks to secondary digestors
(2) adding two 65′ tanks for primary digestion
(3) equipping all four with P.F.T. Floating Covers

The result: P.F.T. "Controlled Digestion" and a new capacity of 20,000,000 gallons per day— 4 times the capacity of its former design!

Now, in addition to increased capacity, plant procedures are *simplified* because additions and withdrawals of sludge and digestor liquor can be made independently, *at the operator's convenience.* Floating Covers simply rise or lower with additions and withdrawals—*no fixed level need be maintained.*

P.F.T. Floating Covers also reduce costly breakdowns and repairs by eliminating all moving parts inside the digestor.

With its new equipment, Arlington soon found its gas production exceeding all requirements. This excess gas is safely handled by P.F.T. gas control equipment, including four 3″ waste gas burners mounted on a separate structure as shown in the illustration above.

As an added feature of this "Controlled Digestion", each tank contains a P.F.T. Supernatant Liquor Selector for automatic, continuous withdrawal of the best digestor liquor available.

Complete information on request—write for bulletin 332.

Design of plant by / *Alexander Potter Associates, New York, NewYork*

P.F.T.

waste treatment equipment exclusively since 1893

PACIFIC FLUSH TANK CO.
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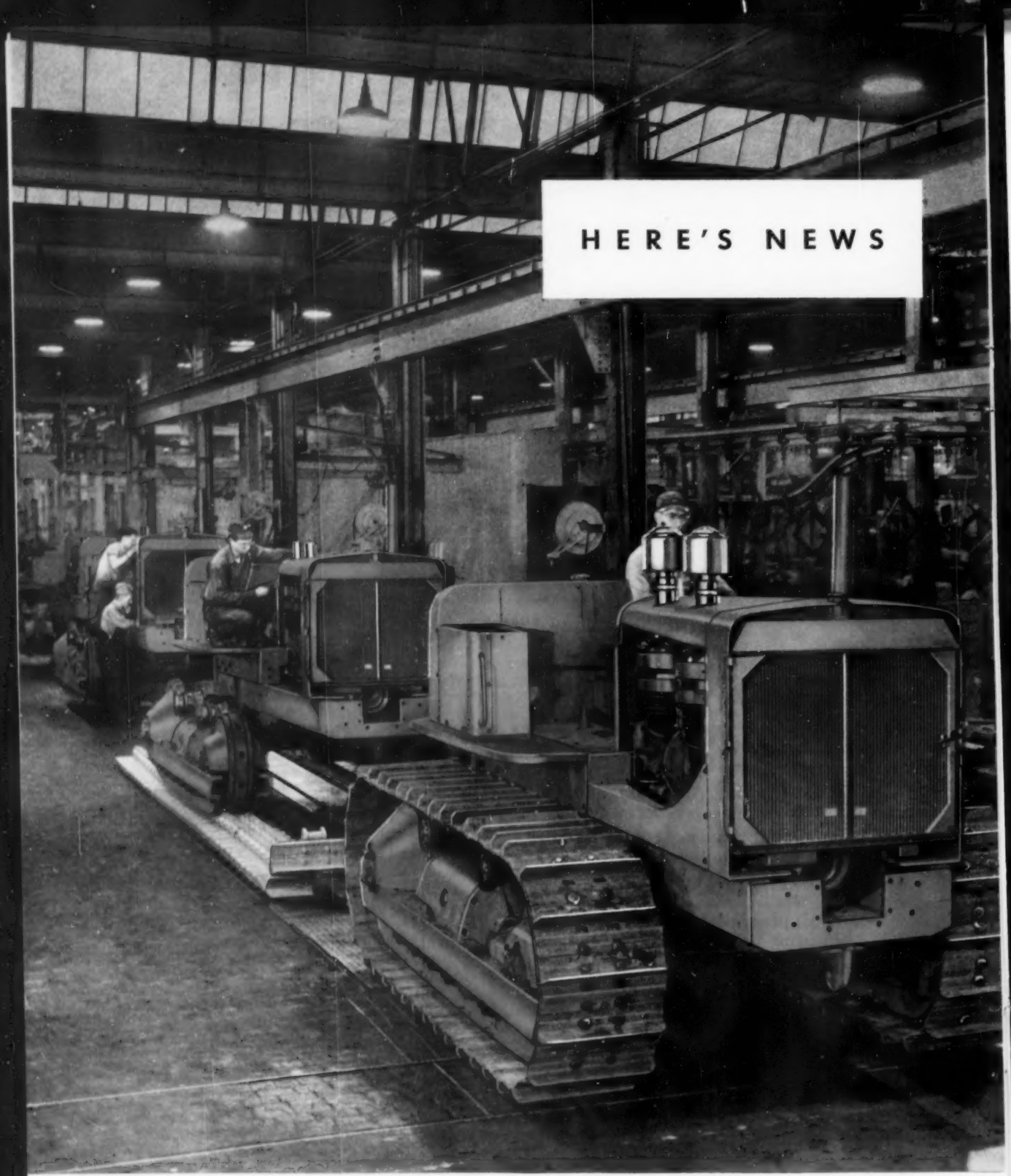

They're here now! **28,000-lb. HD-15's with torque converter drive are already rolling off the assembly line.**

Now's the time to mail this month's Reader's Service card.

Allis-Chalmers Powerful HD-15 adds to its big work advantages

. . . now offers choice of two outstanding drives—

standard transmission with time-saving shift pattern,

or widely accepted hydraulic torque converter drive

From its introduction, the Allis-Chalmers HD-15 has set new standards in performance and long-life service . . . in a new size class. It combines outstanding strength and balance with plenty of power, plus a simplified, time-saving transmission that gives big work output. In addition, the HD-15 offers remarkable service simplicity, with features like unit assembly and 1,000-hour lubrication intervals for truck wheels, idlers, and support rollers. It has proved itself the kind of tractor required on today's jobs.

Now, hydraulic torque converter drive is added as optional equipment — an additional working advantage for the powerful HD-15. This advanced design drive was introduced by Allis-Chalmers in the world's *first* torque converter tractor nine years ago. This modern drive gets more done because it automatically provides the right combination of speed and pull every working minute . . . and hydraulic cushioning assures longer life for both tractor and auxiliary equipment.

Now you can choose the HD-15 with standard transmission *or* hydraulic torque converter drive. Either way you'll be getting the most advanced tractor in the business. Let your Allis-Chalmers dealer give you *all* the reasons why.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

TORQUE CONVERTER

Symbol of greater output, longer life.

Thousands use our Readers' Service card to keep up to date . . . do you?

Here's why — SEWAGE TREATMENT PLANTS Modernize WITH

HOMESTEAD

Self-Seald... Lubricated

PLUG VALVES

1. THEY'RE SELF-SEALING.
2. THEY AUTOMATICALLY ADJUST FOR WEAR.
3. HAVE 100% LUBRICANT SEAL AROUND PORTS.
4. USE LESS LUBRICANT.
5. THEY GIVE POSITIVE SHUT-OFF AND REMAIN DROP-TIGHT for extremely long periods of time.

HOMESTEAD "SELF-SEALD" LUBRICATED PLUG VALVES controlling raw, recirculated and digested sludge at 15 lbs. to 20 lbs. working pressure to heaters, digesters, and drying beds in a Sewage Treatment Plant.

Homestead's exclusive Self-Sealing feature combines the positive sealing action of the tapered plug with the free turning action of a cylindrical plug type valve. And because they are Self-Seald—*automatically adjust for wear as wear occurs*—they assure extra long, leakless service . . . more operations between lubrications . . . require less maintenance and materially lower plant operating costs.

More than 10 years of gruelling service in almost every type of industry has proved them to be the lowest-cost-per-year means of fluid control within their service range.

We make them in semi-steel or cast steel; 100% port area or Venturi type; sizes ½" to 14" for 200 lbs. oil-water-gas working pressures; in Straight-Way or Three-Way types for Wrench or Worm and Gear operation, with High or Low Head Extensions, and Hand Wheels or Floor Stands.

Self-Sealing or one-piece plugs optional in Straight-Way type; 3-Way type has one-piece plug only. Complete data and prices on request.

Write today for VALVE REFERENCE BOOK No. 39-5

How the Amazing "SELF-SEALD" Principle Works

Homestead's patented "Self-Seald" principle is, we believe, the simplest and most effective sealing principle yet developed for lubricated plug valves.

In addition to a full lubricant seal around the ports, and around the top and bottom of the valve, the wedge-action of the plug under line pressure causes the finely-finished surfaces of the plug to press outward against the sealing surfaces of the body.

This self-sealing action keeps the plug surfaces in contact with the bore of the body. The plug automatically adjusts itself for wear, thus assuring extra long life and maximum leakless service.

HOMESTEAD

VALVE MANUFACTURING COMPANY

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Need more facts about advertised products? Mail your Readers' Service card now.

SEWERS ON A CURVE

Are there any articles or comments available regarding the construction of local (small size) storm and sanitary sewers on curves in curved streets? Modern subdivision developments in the majority of cases have curved streets. Sewers constructed on straight lines between manhole openings within curved streets cross and recross water and gas lines which, in this locality, at least, are constructed on matching curves with the streets. This often presents a problem of grade interference, especially where the grades are minimum. Are the problems of locating points on, and the maintaining (cleaning) of sewers so constructed greater than the advantages? Any assistance and information on actual experiences will be appreciated.

F. M. Dickins,
Ass't City Engineer,
Utica, New York.

HOW TO CLEAN CURVED SEWERS

It is now quite common practice to lay sewers with the curve of the street and no cleaning difficulties will be encountered in pipe sizes of 6 in. or larger. Practically all cities now use Flexible Steel Sewer-Rod equipment and these rods will take much shorter bends than any that would be encountered. It would be safe to say that even 6 in. pipe curved 90 degrees on a 12-ft. radius would not be too severe for ordinary cleaning with Flexible Steel Rods to be followed by cleaning with powered Bucket Machines as the bend would not be too much of a bind on the cable that pulls the bucket into and out of the sewer.

A 3-ft. radius for 6-in. pipe would not be too extreme for ordinary cleaning with Flexible steel rods but it might be too tight for pulling buckets through the line. However,

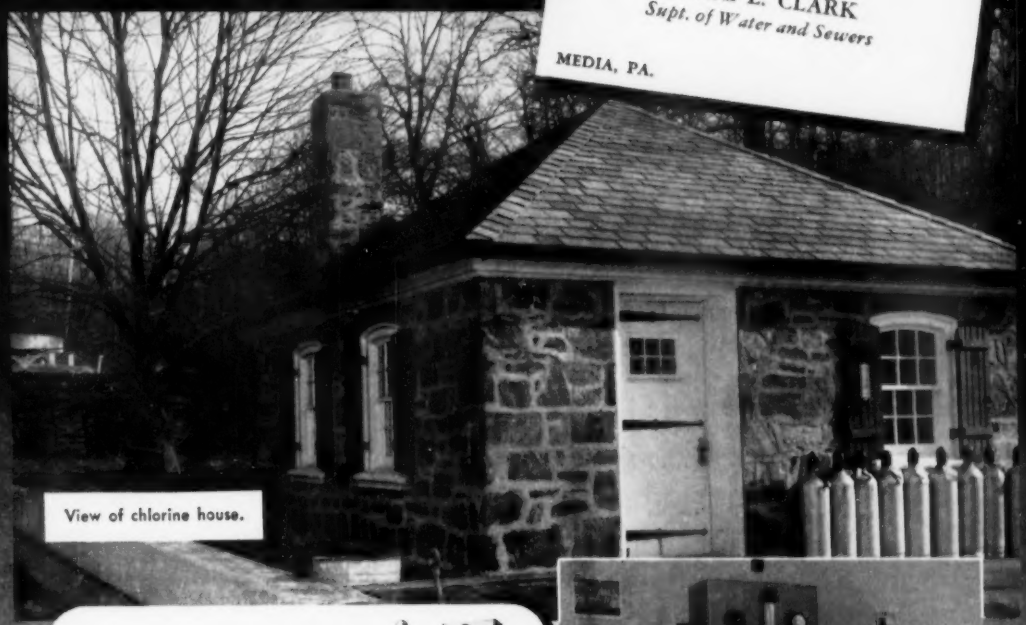
MEDIA, PA.

Sewage Treatment Plant

(COMPLETED IN 1950)

GUSTAVE D. HOUTMAN
President of Council and Borough Engineer
MEDIA, PA.

PAUL L. CLARK
Supt. of Water and Sewers
MEDIA, PA.



View of chlorine house.

BUILDERS CHLORINIZER ON THE JOB!

Model DVSX-M . . . maximum capacity 100# per 24 hours. This manually controlled, solution feed unit has operated continuously for the past three years at negligible expense for service.

The treatment and disposal of sewage is a vital public health measure in any municipality, large or small. For the 7000 people living in and around Media, Pa., the recently completed Sewage Disposal Plant provides big-city sewage handling methods for this moderate sized community. The plant employs primary and secondary treatment, plus chlorination to treat an average daily load of 500,000 gallons.

Accurate chlorination of the effluent as it flows from the trickling filter to the final settling tanks is performed by a BUILDERS *Visible Flow* CHLORINIZER. Here, as in so many other sewage plants and water works throughout the country, the Chlorinizer is contributing important operational advantages due to its simplicity, safety, ease of operation, and durability. For complete information on Builders Water Works Equipment, address Builders-Providence, Inc. (Division of B-I-F Industries, Inc.), Providence 1, Rhode Island.

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PIONEERS IN METERS AND CONTROLS

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Move a Mountain

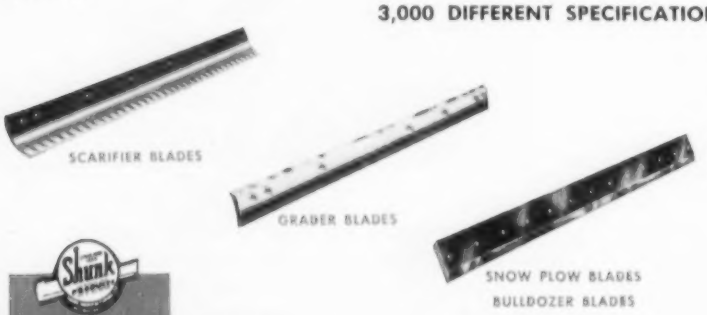
or Push Some Pebbles

Whatever the job, there's a SHUNK blade designed to do it efficiently and economically. For almost a century SHUNK has been manufacturing a full line of fine cutting edges rolled from top-quality steel to fill any maintenance or construction need . . . whether it's gravel, dirt, shale, snow or rocks.

Original equipment manufacturers specify them because of their durability . . . contractors use them because of their dependability . . . distributors like to sell them because they're priced right and deliveries are prompt.

Write us for recommendations on the proper SHUNK blade for *your* job.

3,000 DIFFERENT SPECIFICATIONS



Shunk MANUFACTURING COMPANY

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BEST BLADES MADE

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

no City Engineer would even consider such extreme bends unless for short distances to accommodate some industries where the natural geography of the situation would demand it. In such a short run, a Bucket Machine would not be needed, as this type bend could always very easily be cleaned with steel rods and the proper tools.

About ten years ago, some papers about curved sewers were published and there was no dissenting opinion, with the exception that there would of course be a slight frictional loss of velocity, particularly if the pitch gradient was extremely low. However, this was not considered other than good practice where the occasion presented itself.

Harry R. Crane
Flexible Sales Corporation
Los Angeles, Calif.

BORNEO REPORT

Greetings from the South China Sea. I am on a WHO assignment as a public health engineering consultant to the British Colonial Service in North Borneo and am happy to report it is a real working assignment, visiting the 7 principal population centers; giving my recommendations for sewage collection and disposal (treatment if necessary); outlining general design standards and policies; and making an estimate of the cost. One of the British engineers is assisting. These reports will serve as a basis for appropriations necessary for the reconstruction of the colony which was left pretty well devastated by the Japs who occupied it 1943-1945. This is a most interesting and profitable experience, often bordering on the amazing. A large part of the country is still unexplored but it is known to be very rich in many natural resources especially timber (about 1200 varieties), rubber, some rice, copra and hemp. This is one of the five places in the world where hemp is grown; and incidentally it being developed by a Texan—you can't seem to get away from them. The reconstruction program from a public works standpoint is interesting in many respects. Have been impressed by the competency and seriousness of most of the British Engineers here. I've thoroughly enjoyed working with them. I feel I can contribute something to their sanitation program; and I, too, have learned many things about conditions in this part of the world. I'm

When they say,
"it's the

MOST USED

MOST ABUSED

MOST USEFUL

PIECE OF EQUIPMENT WE HAVE"

Central Construction Co., Indianola, Iowa is talking about its 4-wheel-drive "PAYLOADER" tractor-shovel.

Thousands of others like them too — and so will you. See your nearby "PAYLOADER" Distributor, or write The Frank G. Hough Co., 761 Sunnyside Ave., Libertyville, Ill.

YOU CAN'T COMPETE IF YOUR EQUIPMENT IS OBSOLETE

SAY "HUFF"

PAYLOADER®

THE FRANK G. HOUGH CO. · Since 1920

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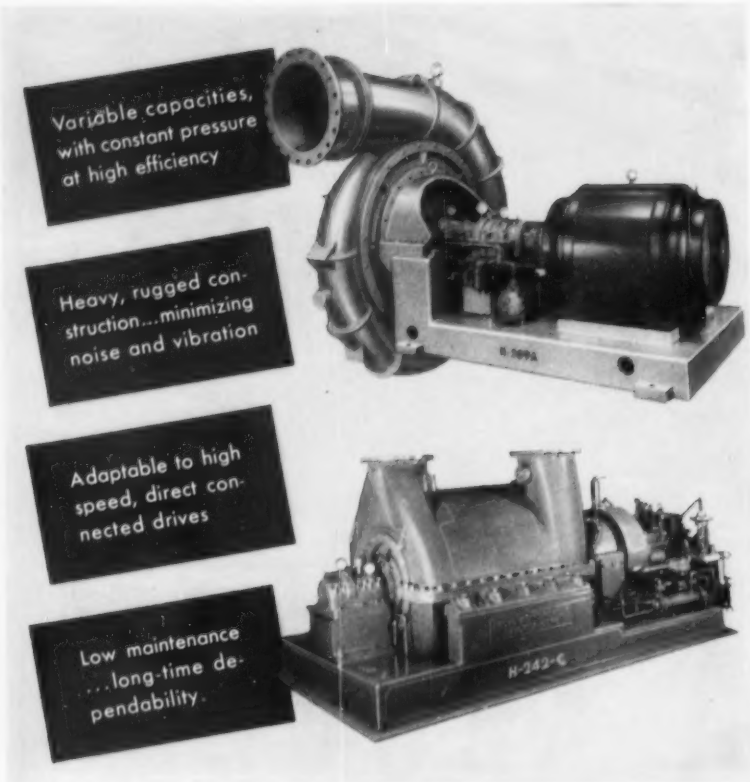
Variable capacities, with constant pressure at high efficiency
Heavy, rugged construction...minimizing noise and vibration
Adaptable to high speed, direct connected drives
Low maintenance ...long-time dependability.

LOOK FOR THE "BIG 4"

WHEN YOU BUY CENTRIFUGALS

Your specific needs may dictate other important characteristics in centrifugal blowers or exhausters. But even so, these four values are essential to over-all successful performance. You'll find them in every Roots-Connersville Centrifugal Unit, regardless of size. And if you desire variations to suit your application, the ability to meet these needs is a heritage of our 100 years' specializing in equipment to handle gas and air.

You'll find first-cost economies, too, in the wide range of capacities of R-C Centrifugals. From 2,000 cfm to 100,000 cfm, you can choose the single-stage or multi-stage unit most closely matched to your individual requirements. You can count on the same high quality of performance that has made many thousands of first-time buyers enthusiastic, repeat customers for R-C equipment.

For your present or future requirements, we suggest you call on Roots-Connersville, for 100 years the specialists in handling gas and air.

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A DIVISION OF DRESSER INDUSTRIES, INC.
354 Poplar Ave. · Connersville, Indiana

Specialists in handling gas and air

Thousands use our Readers' Service card to keep up to date . . . do you?

returning by way of China, India, Switzerland to N. Y. and will call you when going thru.

C. W. Klassen

BOOKS IN BRIEF

PROUD HERITAGE

This is a condensed, yet most interesting and revealing, history of the Lawrence Experiment Station of the Massachusetts Department of Health. Now 67 years young, the old station is being replaced with a modern structure. The men who made this place famous, and what they did, are mentioned briefly. There are 36 pages, with many illustrations, some of them of men you will recognize. A limited number of copies are available on request to C. I. Sterling, Jr., Chief Sanitary Engineer, State Department of Public Health, State House, Boston 33, Mass. Copies are worth writing for.

SOIL STABILIZATION BOOKLET

This booklet contains three papers on the general subject of soil stabilization. The first paper is an evaluation of field projects in which lime and flyash are used for the stabilization of several types of soil. The second paper presents a short-cut method for obtaining the amount of cement necessary for stabilization of sandy soils based on over 2,000 tests by regular procedure. The third presents results of the investigation of six soil additives used to reduce the damaging effect of rainfall on steep slopes. Both laboratory and field tests are reported. Bulletin 69 is available from the Highway Research Board, 2101 Constitution Avenue, Washington, D. C., at a cost of 90 cents.

STANDARD PLANS FOR HIGHWAY BRIDGES

A new book by the Bureau of Public Roads giving standard plans and complete details for various types of superstructures for highway bridges. Plans are especially valuable to small highway departments with limited engineering staffs. Plans for steel I-beams, steel plate girders and reinforced concrete are included: 24 and 28-foot widths, simply supported span lengths 20 to 140 ft., continuous units 130 to 260 feet overall. Standard loadings. Available from Supt. of Documents, Washington, D. C., $1.00 a copy.

Jaeger offers new hi-performance 2″ pump

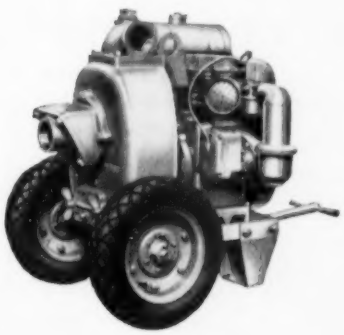
Pumps all the water a 2″ hose can handle. Operates at easy speeds. Weighs only 190 lbs.

Delivering its full rated capacity of 10,000 gph when operating at only 2400 to 2550 rpm (as much as 400 rpm below the speeds of similar ordinary pumps) this Model 2PN actually pumps all the water that can be pulled through a 2″ suction line under average operating conditions. 28″ vacuum at the intake flange is not unusual.

Put this "Sure Prime" pump on your job and see how conservatively it has been rated, even at heads well above 100 ft. Equally remarkable, this performance is achieved by a pump that weighs only 190 lbs. on big, 13″ diameter pneumatic tires, only 160 lbs. on base, and measures only 24″ x 21″ x 26″ high, including tires.

Doubly-sure fast priming is guaranteed by Jaeger's combination of inherent self-priming and "jet" priming — two independent, simultaneous priming actions. Powerful Wisconsin AKN engine, delivering 5.3 hp at 2500 rpm, is ideally suited to this pump. This easy speed means longer life with high efficiency maintained by Jaeger's self-cleaning shell of 20% steel, long-life Lubri-Seal on pump shaft, reversible liner plate, and an impeller adjustable for wear.

For complete information on this model and other Jaeger pumps up to 10″ size, see your Jaeger distributor or send for Catalog P-10.



Only 190 Lbs. on Pneumatics

With capacity and pressure enough for good sized pumping jobs, this Model 2PN is yet light and small enough for a plumber's work. On cushion rubber tires weighs only 180 lbs., on base only 160 lbs.

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"THE PIGMENT IS THE LIFE OF THIS PAINT"

The Flake SILICA-GRAPHITE in this paint

- helps cut maintenance costs,
- increases paint life

because . . . Dixon Flake Silica-Graphite

gives higher chemical resistance — the Flake Silica-Graphite pigment is *chemically inert*, unaffected by acids, alkalies, sunlight, or corrosive industrial fumes.

and . . . Dixon Flake Silica-Graphite

has higher water repellency — layer on layer pigment structure resists moisture penetration.

has greater film flexibility — an inherent lubricant quality retains film flexibility longer.

Cut maintenance paint costs up to 50%

Get the whole money-saving story in FREE Bulletin #V-60 which includes 17 actual paint chips . . . complete technical and application data.

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Get full details of this month's products . . . mail your Readers' Service card today.

CONTROL OF QUALITY OF READY MIXED CONCRETE

The third edition of this booklet, prepared and revised by the Ready Mixed Concrete Association, describes in simple terms the entire procedure necessary to produce satisfactory ready mixed concrete and get it to the customer in that condition. The 76-page paper bound book may be obtained from the National Ready Mixed Concrete Association, 1325 E. St., N.W., Washington 4, D. C. at a cost of 55 cents.

THE STONE CATALOG

This is a valuable and highly pleasing 48-page booklet which shows pictures of building stone in its natural beauty and color. Every type of stone is included, with detailed descriptions, characteristics, color range, properties, size data, uses and full classification. There is also a membership list of the International Cut Stone Contractors' and Quarrymen's Association, so you can tell where the stone can be obtained. Mighty fine job. Copies free to engineers, architects, contractors and builders if they will write on their business letterhead. Write to Stone Council, 5351 Winthrop Ave., Indianapolis, Ind.

ASTM STANDARDS ON BITUMINOUS MATERIALS

The 1953 edition of this compilation brings together in compact, readily usable form the 105 standard and tentative specifications, test methods, recommended practices, and definitions of terms pertaining to bituminous materials for highway construction, waterproofing and roofing. Copies of this 436-page book can be obtained from the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa., at $3.50 each.

SEPTIC TANK DESIGN & OPERATION

This is a discussion, with plenty of data presented, of septic tank design and construction from the European viewpoint. Much of the material is fully applicable to USA conditions and should be highly valuable. The design in Appendix I of a sand filter built into a septic tank is most interesting. There are 109 pages. Columbia University Press, 2960 Broadway, New York 27, N. Y. $1.50.

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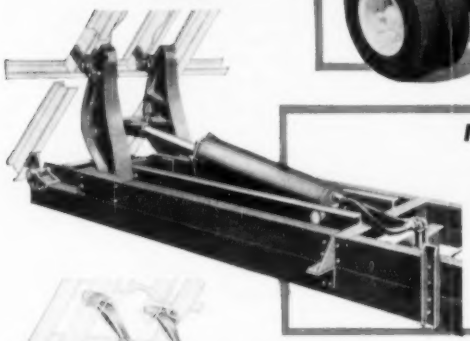
for every Make and Model Truck

All parts of PERFECTION Hoists — pumps, power take-offs, and cylinders are engineered and guaranteed by PERFECTION. Each part is carefully inter-designed with all other parts, to produce units of exceptional efficiency, power, and dependability.

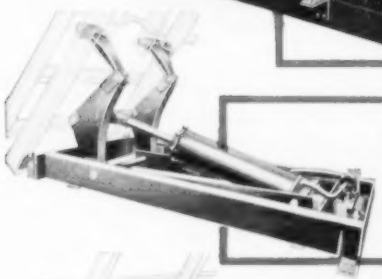
Model 7780 Telescopic

3-stage, telescopic, dual cylinder design provides tremendous lifting capacity with least weight, simple construction, and smooth operation. Direct upward lift is applied at the center of the load. For mounting on trailers with bodies up to 30 cu. yard capacity. Extra heavy-duty service.



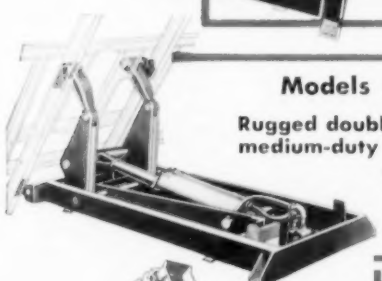
Models 727 • 827 • 1027 • 1034 Roll-A-Lift

A constant-low-pressure-type hoist that develops tremendous lifting capacity in relation to its piston displacement. Engineered for those jobs that require a rugged and powerful hoist. Four standard models cover body capacities from 6 to 20 cu. yards. Heavy-duty service.



Models 725 • 820 • 825

Compound-type, double lift-arm design, for medium and heavy-duty service. Three standard models for body capacities of 6 and 7 cu. yards.



Models 615 • 715 • 715L • 720

Rugged double lift-arm hoists for light and medium-duty service. Four standard models cover body capacities from 1½ to 6 cu. yards.

Models 615B 715B • 720B

Low-mount, double lift-arm hoists for mounting with medium and heavy-duty platform and stake bodies. Three models for bodies from 9 ft. to 16 ft. long.

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Please send me complete information on items checked.

☐ Telescopic Hoists ☐ Roll-A-Lift ☐ Compound Lift Arm Hoists ☐ Booster Hoists ☐ Dump Bodies _____ cu. yd. cap.

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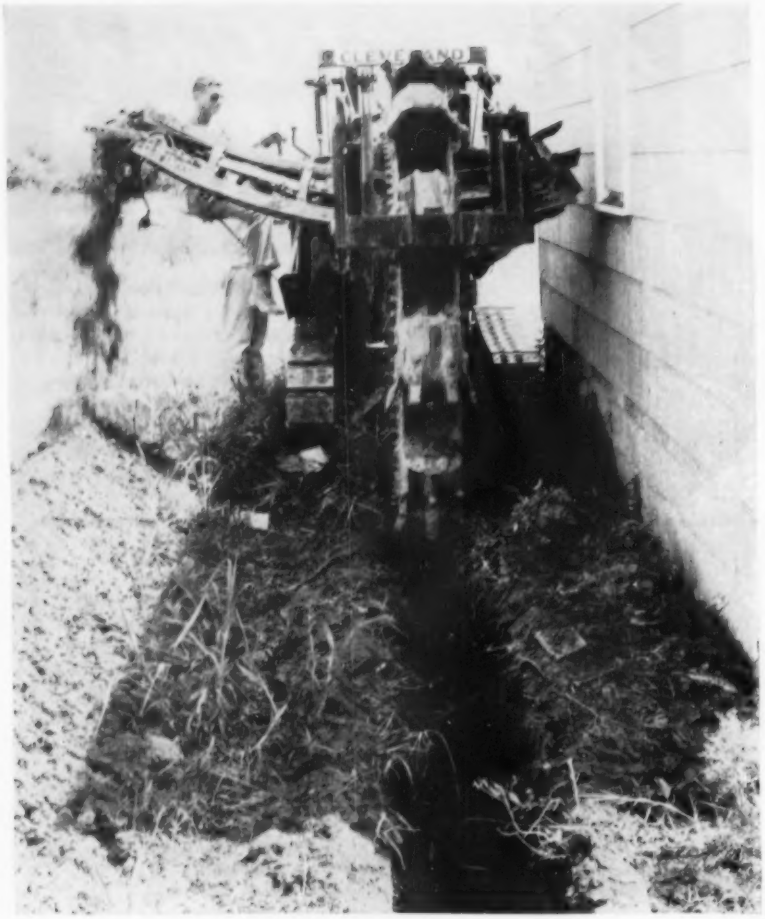

20" from Trench to Wall

IN NORFOLK, VA. this Model 92 CLEVELAND "Baby Digger" shows how its useful compactness enables it to place a trench safely within 20" of a house wall. Balanced perfectly on its smooth full crawlers, the 92 maneuvers easily in even the closest quarters, with less damage to lawns, walks and driveways. Because it digs any size of trench from 10 to 20 inches wide and up to 5 feet deep, it is usable on a wide variety of jobs.

The 92 hustles safely from job to job . . . at legal limit speeds . . . because it's so easily portable on the drop-axle, tilt-bed CLEVELAND T5 Trailer.

Write for descriptive literature and specifications or get the full story on CLEVELANDS from your local distributor.

THE CLEVELAND TRENCHER CO.
"Pioneer of the Modern Trencher"
20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

Now's the time to mail this month's Reader's Service card.

LEADERS IN PUBLIC WORKS

★

John D. McDonald joined the engineering staff of the City of Springfield, Mass., in 1933; was superintendent of sewage treatment plants and pumping stations from 1940 to 1952, with time out for service in World War II. Since 1952, he has been chief engineer for the Board of Public Works. His duties include planning and preparation for all sewerage, drainage and highway projects for the city of Springfield, with submission of reports and recommendations for these and other public improvements. He is shown here looking over a proposed incinerator site. Parts of the sewage treatment plant are in the background.

His wartime service included 28 months overseas, with duty in New Guinea, the Philippines and Korea. He spent 14 months on the latter assignment rehabilitating water treatment plants. He is now a major in the Engineer Corps Reserve.

He was a recipient of the George B. Gascoigne award for proficient sewage treatment plant operation, a contributor to various technical magazines and an instructor at the University of Massachusetts excellent annual short school for operators. He is a graduate of Rensselaer Polytechnic Institute, 1931, with the degree of Civil Engineer. He is married and the McDonald daughter is now in high school. As to his hobbies, he says: "With work piled up, are you kidding?" He is a member of the FISWA and active in the New England area.

Only 22 Pounds Complete

THE NEW HOMELITE

MODEL 17

One Man Chain Saw

3.5 BRAKE* hp

*Actual Dynamometer Rated Horsepower

Cuts 18 inch trees in 18 seconds — Cuts trees 4 feet or more in diameter

Here is the highest quality, lightweight chain saw at the lowest possible cost. It's the *new* Homelite Model 17 . . . the mighty mite of chain saws . . . the only saw its size with 3.5 actual dynamometer rated horsepower. Powerful enough to do the job *faster* . . . light enough to make the job *easier*. . . this new Homelite will save time, save money and cut labor and operating cost on every type of woodcutting job.

As Low As

$259

Complete

Built and backed by Homelite, manufacturers of high powered lightweight gasoline engine driven units for more than thirty years, this sturdy, dependable saw will *out-perform* and *out-last* any other saw its size or price. Makes every type of cut . . . notching, felling, limbing, bucking, boring and undercutting. Operates in any position . . . cuts right, left, up, down, or upside down . . . without carburetor adjustment or loss of power. Available with 14″ to 38″ straight blades or 14″ and 18″ plunge cut bows.

Send coupon today for more information or free demonstration

HOMELITE CORPORATION, 2103 Riverdale Ave., Port Chester, N. Y.
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Here's Good News!

LE ROI *dependability*

LE ROI *performance*

in a front-end loader and truck mixer line!

Newly formed Le Roi-Transo division offers you an outstanding line of material-handling equipment that delivers the high standards of performance you have come to expect from Le Roi

Now — through the Le Roi-Transo Division — Le Roi brings you front-end loaders and truck mixers — proved performers that do your jobs faster, easier, at less cost.

Le Roi-Transo Front-End Loaders give you the extra power and dependability of famous Le Roi engines, plus mobility and speed — to let you scoop, carry, maneuver, reverse, and dump with pin-point accuracy and efficiency.

Features include patented "Bucket Rocking Action" for faster, heaped loads . . . torque-converter that supplies a smooth flow of power to the drive wheels . . . clutch-type reversing transmission that cuts reversing time 95% . . . low-carry position that assures loader balance, adds safety and maneuverability.

Le Roi-Transo Truck Mixers are Le Roi-powered, truck-mounted mixer-agitators with outstanding performance records for mixing action, fast loading, speedy discharging of slump concrete, shock-free starting and discharge-reversing with a full load.

The patented Transo direct drive eliminates non-productive dead weight — eliminates ring gears, chains, and sprockets, thus cuts replacement and maintenance costs.

Yes, sir, Le Roi-Transo Front-End Loaders and Truck Mixers are engineered to speed your work and keep costs down. In addition, Le Roi provides a nationwide network of distributors that puts genuine Le Roi-Transo parts, skilled mechanics, and expert service as near as your telephone.

Have your Le Roi-Transo distributor tell you more about the Le Roi-Transo unit that meets your requirements. Write for bulletins.

Compressors
Rock Drills
Tractair
Engines
Front-End Loaders
Truck Mixers

TRANSO

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A Subsidiary of Westinghouse Air Brake Co.

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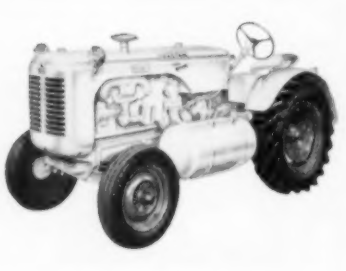
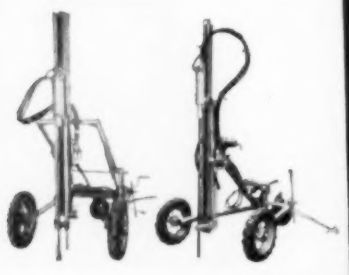
Le Roi Airmaster Air Compressors
8 sizes — 14 models



Le Roi Tractair — *Combination 35-hp tractor and 105 cfm compressor*



Le Roi-CLEVELAND Wagon-Drills — *Heavy-duty model DR30 and lightweight DR34*

LE ROI-TRANSO TLF-150
Front-end Loader

4-wheel drive.

Short (84") wheel base.

1½-yd. struck flush bucket capacity.

Maximum dumping height of 14' allows easy clearance of bins, hoppers, etc.

Low 36" to 48" normal carry position reduces lift time from ground.

LE ROI-TRANSO TL-100
Front-end Loader
1-cu. yd. capacity. 2-wheel drive.

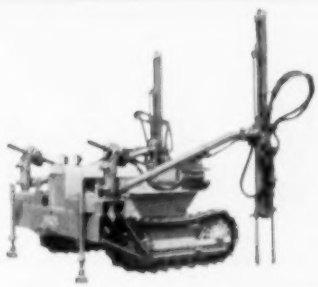
LE ROI-TRANSO Truck Mixers
Shorter and lighter than any mixer-agitator of similar capacity! You can use a lighter-weight truck chassis.

Available in 3, 4, 4½, 5, 5½, 6, 6½-yd. capacities, separate engine or truck-engine drive. Open-drum, standard-door, deluxe-door models.

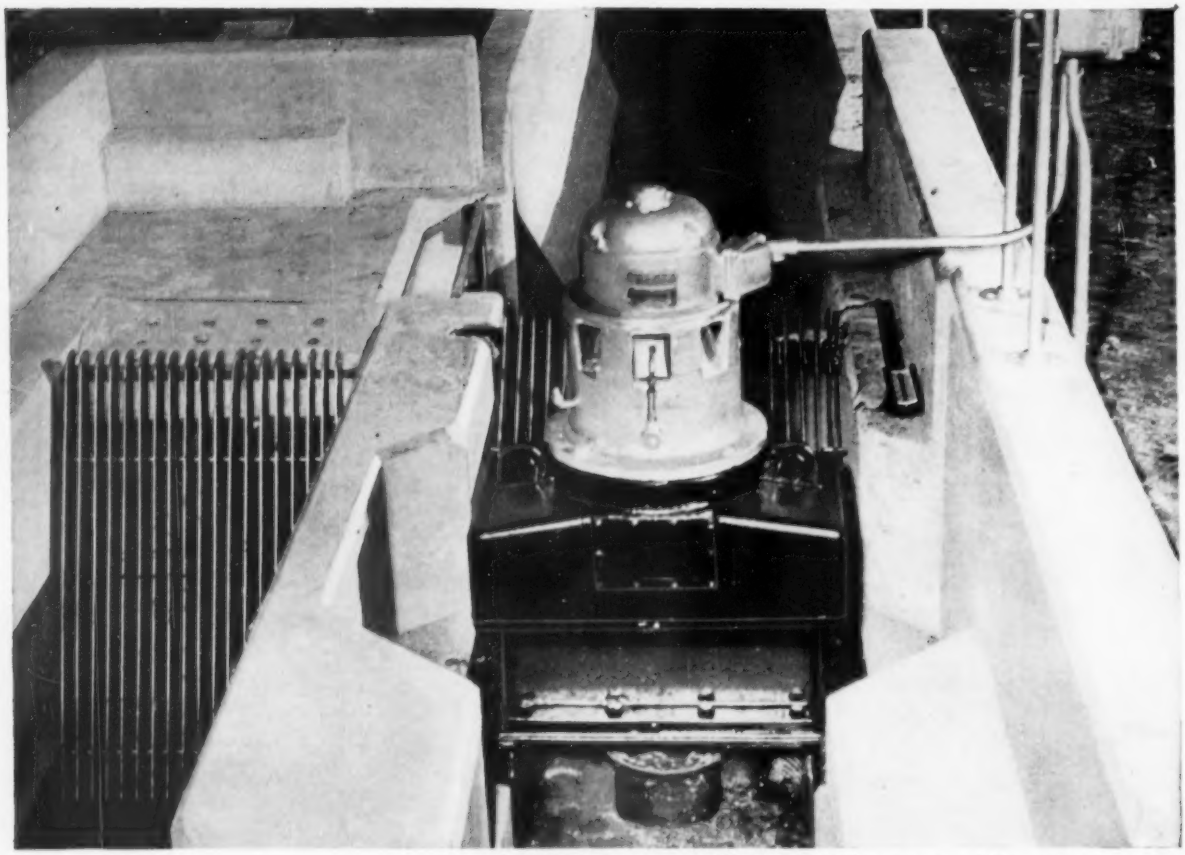
MORE UTILITY! • MORE PRODUCTION! • MORE PROFITS!

LE ROI

Le Roi-CLEVELAND Paving Breakers and Sinkers — Sizes from 18 to 80 lbs.



Le Roi-CLEVELAND T-286 Self-Propelled Dual Drill Rig — equipped with air-feed sinker drills or drifters



COMMINUTORS ARE READILY INSTALLED in new or existing rectangular straight-through flow sewage channels. They may be used either as single units shown above or multiple units, depending on your needs.

Worthington comminutors eliminate costly handling of sewage solids

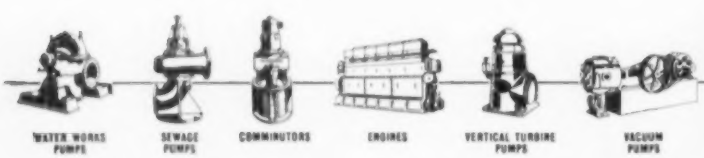
With a Worthington comminutor operating continuously, you can forget about raking, hauling, grinding, and burial or incineration of coarse solids. Here's why:

Worthington comminutors *automatically* cut coarse solids in raw sewage so rapidly that loss of head is minimized. Peak loads in excess of comminutor capacity are easily handled by a baffle screen. The addition of a mercury seal keeps all working parts watertight for continuous operation even when comminutor itself is submerged.

Quick, simple installation in either new or existing rectangular sewage channels, indoors or outside, keeps costs to a minimum. Stainless steel screens and cutters are easy to remove for inspection, adjustment, sharpening or replacement.

Worthington engineers will be glad to help you mechanize and modernize this or any other phase of your sewage treatment. Write for full details on Worthington's complete line of sewage disposal equipment. Worthington Corporation, Public Works Division, Section W.3.3, Harrison, N. J.

W.3.3



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Public Works Equipment

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NEW OLIVER 88WT Hydro-Trencher

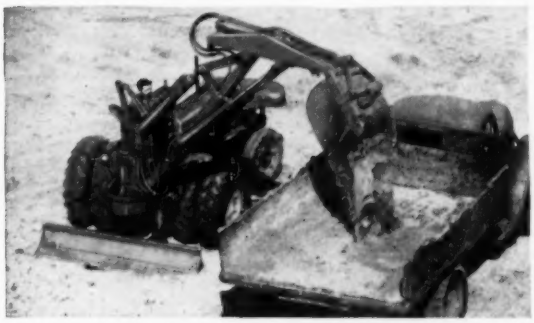
Digs to 10 feet in toughest going!

Here is a trencher that won't stop when it comes to rocks or roots. Tremendous hydraulic down pressure forces the half-yard bucket into the ground for a fast, full load. New dual-circuit control gives constant pressure, more positive control and greater flexibility in any kind of going.

Take a close look at this new trencher. It reaches long and digs deep. Its simple, sturdy construction and all-hydraulic operation give low maintenance and long service. The hydraulic stabilizer blade not only holds the tractor level and steady, but is an excellent back-filler blade. And, by simply turning the trencher bucket around you have an efficient swing loader.

Test the new Oliver 88WT Hydro-Trencher on your work. See how easy it is to operate and how readily it digs or loads the toughest material. And remember, the 88WT is ready to work or move instantly, and takes only one man to operate. Get in touch with your Oliver Industrial Distributor for a demonstration, soon!

Right through the roadbed! Powerful hydraulic down pressure digs through this material with ease. Positive dual-circuit control gives a choice of *three* separate lift or drop speeds on the boom for any condition. Bucket rotation and dipper stick design permit clamping rocks larger than the bucket itself. Special boom cylinder available for digging to 12 feet.



It's a swing loader, too! Remove the bucket hinge pin and turn the bucket around. In minutes the trencher becomes a loader. No extra parts are needed. The exceptional bucket rotation permits loading into a truck up to 10 feet, 6 inches. Optional loading bucket loads up to 12 feet.

One-half yard bucket! The fast hydraulic operation and big bucket capacity of the 88WT let you do more in less time. All-hydraulic operation means, too, that there are no expensive cables or clutches to replace. Maintenance is simple and low cost.

THE OLIVER CORPORATION

400 West Madison Street, Chicago 6, Illinois

Now's the time to mail this month's Reader's Service card.

Dual electrical system assures reliable power at Elm Fork

Completion of the Elm Fork Water Purification Plant represents a major stride in the water works expansion program at Dallas, Texas. Costing eight million dollars, this outstanding installation doubles the city's purified water supply. It boosts total plant capacity to 200-mgd.

Reliable electrical service at Elm Fork is assured by a secondary selective radial distribution system—adapted by Dallas' engineers, in collaboration with the consulting engineers and Westinghouse. Duplicate primary feeders, bus, transformers and switching equipment are provided. Thus, should a feeder or transformer fault occur, service is restored quickly to all loads.

Compact and unitized Westinghouse equipment was chosen for the Elm Fork system. It conserves building space . . . simplifies maintenance due to accessibility of breakers . . . can be expanded easily as loads grow.

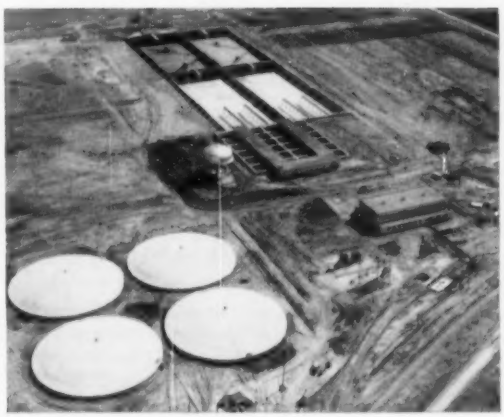
You can profit from this same kind of assistance. Whether the program calls for expansion or modernization, Westinghouse engineers are ready to help you and your engineers adapt a distribution system . . . and match it with a complete line of co-ordinated equipment.

For full details call the Construction Application Engineer at your local Westinghouse Office. Or write direct to Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

J-94993

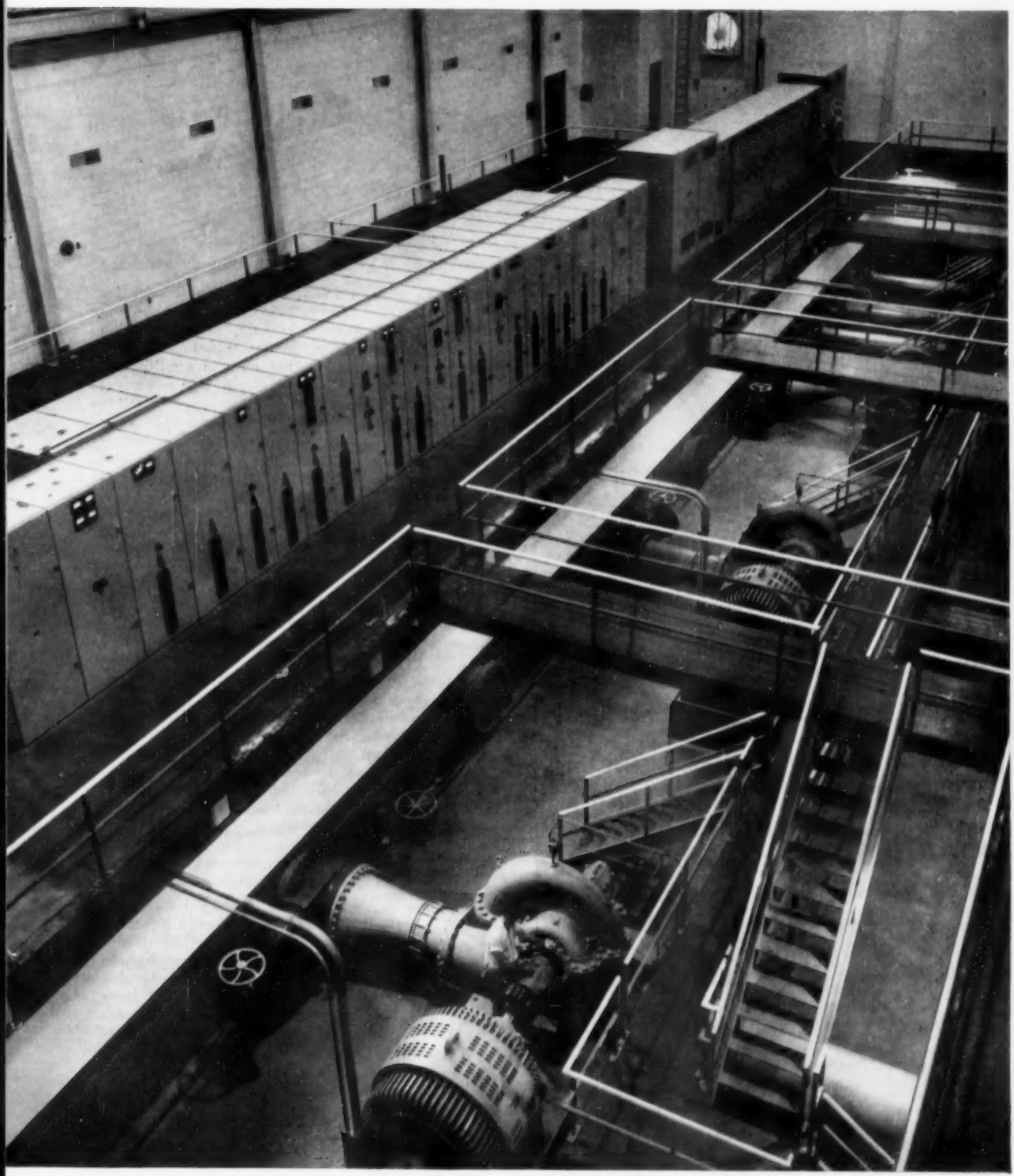
YOU CAN BE SURE...IF IT'S Westinghouse

Westinghouse Battery Charger Board controls motor-generator sets which charge batteries. These supply d-c power to the swichboard relays as well as other devices in the Elm Fork electrical distribution system.



Elm Fork Water Purification Plant doubles the Dallas, Texas water supply. Along with new mains, added recently, it can be expanded easily in the future. Consulting engineers for the project: Myers & Noyes.

Thousands use our Readers' Service card to keep up to date . . . do you?



Westinghouse Metal-Clad Switchgear is mounted in a single line, over 100 feet long. This permits maintenance of circuit breakers and transfer of loads from front of switchboard, without power loss at any point.

Need more facts about advertised products? Mail your Readers' Service card now.

THESE NEW TYPE... TRAFFIC SIGNS

AFFORD the SAME SERVICE at ½ the COST!

EZ-On SIGN FACES by GRACE ARE APPLIED RIGHT OVER YOUR PRESENT SIGNS

1. You slip 'EZ-ON' Faces over old sign. *Note Wide Flanges.*

2. Then bend flange backward holding 'EZ-ON' Face in place.

3. Use special Crimping Tool to clamp flange and secure sign.

EZ-On FACES BEING APPLIED at 6th & WASHINGTON in PADUCAH, KY.

SAVES TIME AND LABOR ... EZ-ON faces attached in only 5 minutes ... *without taking old sign out of service!*

THEY'RE REFLECTORIZED

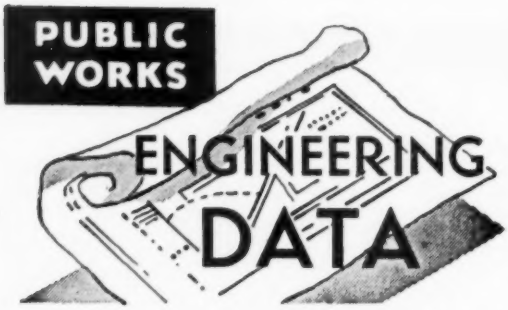
STANDARD WARNING and REGULATORY COPY...

Here's a new idea in traffic signs that saves time and money! Now in use by Highway Departments in Kentucky, Ohio, Iowa, Missouri, meeting all requirements in reflective qualities and serviceability. They slip over your present signs restoring their 'newness', hence your old signs are never out of service. May be applied in 5 minutes! (See illustrations). 'EZ-ON' Sign Faces are made of 30 ga. steel in 2 shapes... Diamond and Octagon, 24 in. and 30 in. sizes. Standard and Special copy as you may require. INVESTIGATE..and save!

SEE YOUR NEAREST REPRESENTATIVE OR WRITE US DIRECT

GRACE SIGN & MFG. CO.

3600 S. SECOND ST. ST. LOUIS 18, MO.



Street Repair Work Speeded by Paving Machine

According to San Francisco's annual report for the year ending June 30, 1953, the Adnun paving machine, put into service in July, 1952, allowed a tremendous improvement in the Bureau of Street Repair's resurfacing work, not only in quality, but in quantity. In all 2,672,000 square feet of pavement were resurfaced by use of this machine. This, together with the 774,200 square feet resurfaced by hand, made a total of 3,446,400 square feet resurfaced during the year. A comparative quantity is not available for 1951-1952 but a fair estimate is less than 2,500,000.

Funds for the purchase of materials were insufficient to the extent that the paving machine could be used only a little more than seven months. The machine is capable of placing more mixture than the present asphalt plant can produce. However, sufficient trucks were not always available to take full advantage of the plant's limited capacity.

The cost of machine resurfacing averaged approximately 5.5 cents per square foot. Hand resurfacing in 1951-1952 cost 8.2 cents per square foot; equivalent to 8.7 cents in 1952-1953.

Hand resurfacing in 1952-1953 cost approximately 9.0 cents per square foot but the type of work was not comparable to that performed in 1951-1952. As the paving machine was used for most of the "open" work the hand work included a greater proportion of more difficult jobs, such as narrow streets and steep hills.

Investigations of Temperature Effects on Sludge Digestion

Preliminary work of an exploratory nature has been done at the University of California Research Station on a new project in which further studies of the temperature aspects of digestion will be undertaken. Present plans for the investigation involve a series of anaerobic digestion experiments at temperatures ranging from 30 to 65°C inclusive in increments of 5°C. The thermal adaptation of seed organisms to the different temperatures and the progress of digestion at these temperatures will be observed. Variables to be studied at each temperature will include loading and detention period. Qualitative and quantitative determinations of gas produced, reduction of volatile solids and organic acids produced at mesophilic, thermophilic and intermediate temperatures will be made.

Electric Eye "Senses" Weather, Warns Drivers

An electronic device, known as a "weather senser," will warn motorists of driving conditions ahead on one section of the Pennsylvania Turnpike. This de-

EVERY FEATURE OF THE BARBER-GREENE 848 PLANT WAS DESIGNED TO INCREASE TONNAGE PRODUCTION

There is nothing to equal the constant, low-cost, top-capacity production of the 848 plant that provides 80 to 140 tons per hour of the finest bituminous mix.

Its portability means less moving time. Its separate components mean less set-up time. Its automatic, interlocked operation assures accuracy and means less loss due to the human element.

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The Ranney Collector is a unique kind of "well." It can produce more pure, cool water from one well, for less money, than ever possible before, with multiple wells. This greater yield adds millions of gallons to your present water supply, with fewer pumps and personnel. Installation and maintenance costs are held to a minimum.

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I believe a Ranney Water Collector can save money for my community. Please send me further information.

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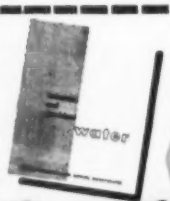

RANNEY METHOD WATER SUPPLIES, INC.

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vice was installed on an experimental basis and is now flashing signals to eastbound traffic on the Philadelphia extension of the toll road, near Bowmansville in Lancaster County. It is automatically-operated, and consists of a sign seven by eleven feet in size, with instruments that can detect snow, rain, and freezing weather.

A master device receives information from three sources: a highly developed electric eye, a precipitation pickup, and an element that can "sense" freezing and snow. The master device then flashes the findings onto the face of the sign in large letters. The sign may read "snow," "fog," "wet," or "freezing." When the super-highway is free of weather obstacles, the sign says "clear roadway." Cost of the device and installation was about $10,000.

Cost of Cleaning Catch Basins in San Francisco

A total of 16,016 out of about 25,000 catch basins in San Francisco were cleaned through the use of 10 eductors. This averaged 63 basins per day at a cost of $5.49 per basin and involved the removal of about 98,000 cubic yards of material.

Concrete for Zebra Crossings

Experimental zebra crossings laid by the Road Research Laboratory, England, indicate that such markings of concrete will give many years of service. To provide good contrast at night, particularly on roads carrying heavy traffic, the white stripes of each zebra crossing are given a smooth finish and the black stripes a rough finish.

Nine crossings, with cast in place white stripes and mastic asphalt black stripes, have been laid in streets of Stepney. One of the crossings has had some 14,000 tons of turning traffic over it every day for eighteen months and looks little different from the day it was laid. The others, in which small variations were made in the materials used, have had traffic over them for about eight months.

These concrete stripes were laid either 1 in. or 2 in. thick on a concrete base of 7 or 9 in. A high early strength concrete was used so that traffic could be allowed over the crossing as soon as possible. A white aggregate is essential for the stripes, because it will become exposed with wear. Calcined flint was found to be satisfactory and was used in all the experimental crossings. The addition of 5 per cent of titanium oxide was found to make the concrete whiter and give a better contrast with the black stripes. Precoated chippings spread thickly were rolled into the asphalt to provide a rough-textured surface.

Eight other crossings have been laid in which the black and white stripes are formed with precast concrete blocks. Three, laid by the Road Research Laboratory, have been in service for five, four and two years respectively and all of them have behaved well. They use blocks 4 in. thick and 1 ft. square.

More recent crossings using blocks 3 in. and 2 in. thick have been laid in Stepney. Their condition also is good, after eight months and four months wear respectively. The blocks are made of colored concrete ¾ to 1 inch thick, backed with high quality ordinary concrete. The blocks were bedded on a layer of mortar on a concrete base, and the joints filled in with a colored mortar to match the color of the blocks.

These data are from Highways and Bridges, a British engineering publication.

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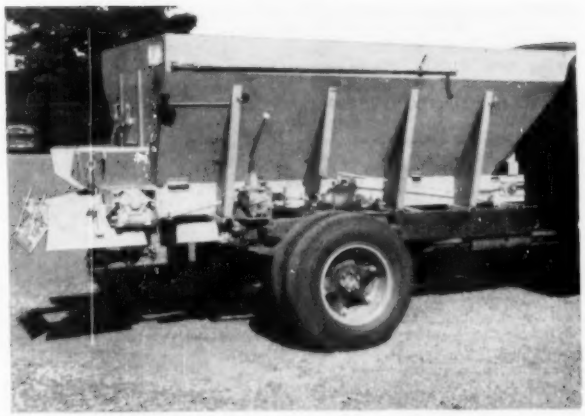

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Operation is by positive drive direct from truck power take-off. Spread of material is controlled by adjustable baffles. Material can be spread on one side of the unit if desired — or up to 30 ft. wide with baffles fully open.

A roller chain, actuated by the driving shaft, connects with an independent fully enclosed reduction unit for the spinner — so that conveyor and spinner are in proper speed relation at all times. Spinner unit can easily be removed and hopper used for hauling miscellaneous materials.

Standard sizes 5 and 9 cu. yd. Designed for easy and proper mounting on standard motor truck chassis. For litrature write today to Dept. P-34.

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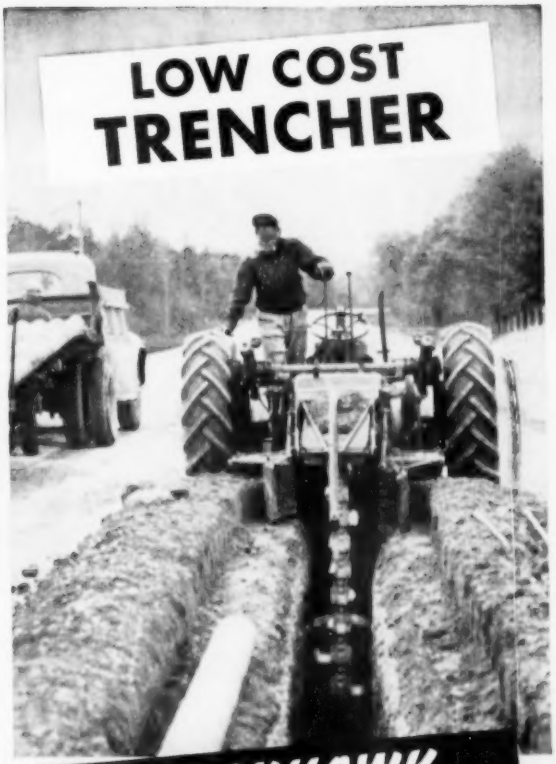

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Better Highways Through Salt-Soil Stabilization

162. Practical information for the men who build, repair and maintain our highways is provided in two bulletins issued by the International Salt Co., Inc., Scranton, Pa. General principles of salt-soil stabilization, applications, plant mix and road mix are described. Check the coupon for your copies.

Cut Road Building Costs With A Tamping-Leveling-Finisher

175. For a full description of roadbuilding methods with a tamping-leveling-finisher which lays a smooth mat without forms, tamping and compacting to desired grade, get Bulletin 879-A from Barber-Greene Co., Aurora, Ill. Check the coupon today.

What Should You Look For In a Power Sweeper?

206. Helpful information to aid you in the selection of a power sweeper to fit your needs is provided in Bulletin 85.2, issued by G. H. Tennant Co., 2530 N. Second St., Minneapolis 11, Minn. Full data on the highly maneuverable Tennant Model 75 Sweeper is included. Get your copy by checking the coupon.

Helpful Data on Butterfly Valves

238. A comprehensive catalog which furnishes full data on the design and application of Pratt Rubber Seat Butterfly Valves has been made available to designers and engineers by Henry Pratt Co., 2222 So. Halsted St., Chicago 8, Ill. Check the coupon for your copy of this excellent source of practical information.

Waste Treatment Equipment and Controls

240. A new leaflet giving data on W&T Visible Vacuum Chlorinators and a variety of automatic controls to meet waste treatment problems has been published by Wallace & Tiernan, Inc., 25 Main St., Belleville 9, N. J. Get this helpful information by checking the coupon.

Better Lighting For Shopping Centers

245. Economy and good appearance are combined in the Union Metal Monotube Poles specifically designed for shopping center parking lots. Typical installations, various pole designs and bracket arrangements are shown in Folder LS-15, issued by Union Metal Mfg. Co., Canton 5, Ohio. Check the coupon.

Get the Hoist and Body Handbook

79. Factors to be considered when ordering hoists, bodies and accessories, including capacities, weights and measures of bulk materials, dumping angles, etc. are presented in convenient form in the Hoist and Body Handbook prepared by the Perfection Steel Body Co., Galion, Ohio. This helpful data, plus information on a full line of hoists and bodies for every purpose is available from the manufacturer. Check the coupon.

Comprehensive Data on Cast Iron B & S Pipe

114. Full specifications, including A.S.A. which give all dimensions of standard and alternate patterns of American Mono-Cast Centrifugal Bell and Spigot Pipe in 3" to 48" sizes, will be found in a comprehensive booklet furnished by the American Cast Iron Pipe Co., Birmingham 2, Ala. Check the coupon for your copy.

Chemicals Used in Water, Sewage and Waste Treatment

248. A 16-page technical bulletin offered by Omega Machine Co., 345 Harris Ave., Providence, R. I., compiles in convenient form full information on the chemicals used in water, sewage and waste treatment. Data includes formulas, common names, commercial strengths, forms in which they may be obtained, sizes of shipping containers, and many other items, including recommendations for handling and feeding. Get this useful bulletin by checking the coupon.

Assistance in Planning Electrical Systems

189. On every water and sewage plant expansion, modernization or new construction job, you can get valuable assistance in planning the electrical system from Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. Be sure to investigate compact, unitized Westinghouse equipment which conserves building space and simplifies maintenance. Check the coupon for full data.

Investigate "Tifa" For Insect Control

45. With "Tifa", the Todd Insecticidal Fog Applicator, chemicals for insect control are distributed as a true, clean fog which effectively penetrates all spaces where insects may hide. For full data on the use of this machine in public health programs, write Combustion Equipment Div., Todd Shipyards Corp., 81-16 45th Ave., Elmhurst, N. Y., or use the coupon.

Do You Have An Independent Source of Electricity?

27. An independent source of electricity which will supply power for vital services when regular sources fail can be invaluable during emergencies. Check Kohler Bulletin KEP-31 which furnishes data that will help you select the plant best suited for your needs. Many models, 500 watt to 30 Kw, portable and stationary, are described. Write the Kohler Co., Kohler, Wis., or use the coupon.

Get Jobs Done Faster With Multipurpose "Scoopmobile"

282. The efficient Model C Scoopmobile cuts time and labor costs with its versatile applications and quick-change accessories. Features power steering; three-wheel maneuverability; scoops, loads, transports, hoists. Get full data from Mixermobile Manufacturers, 8027 N.E. Killingsworth, Portland 20, Ore. Check the coupon.

Helpful Data on Excavator Design and Applications

341. A liberally-illustrated 8-page bulletin describing the 15-ton lift capacity, ¾ cubic yard dipper capacity Model 205 excavator has been issued by Koehring Co., Milwaukee 16, Wis. Full details are provided on the rugged construction and use as a shovel, hoe, dragline, clamshell or crane. Available either crawler mounted or on a truck body. Check the coupon for this attractive bulletin.

3-54

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NOW 6-WHEEL and 4-WHEEL GRADERS

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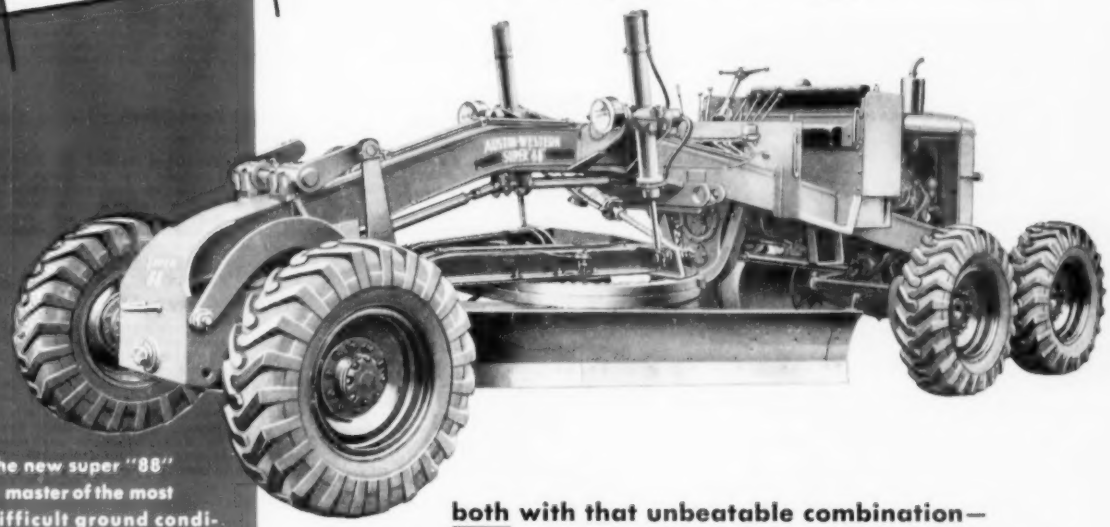

The new super "88" is master of the most difficult ground conditions. Four driving, steerable wheels at the rear team up with the live, climbing power of Austin-Western's famous front truck to provide flotation no ordinary motor grader can hope to equal.

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Whatever the job . . . whatever the ground condition . . . your best buy among machines of medium size is an Austin-Western Power Grader of the "88" Series. With exclusive All-Wheel Drive for 30% greater Power-at-the-Blade; exclusive All-Wheel Steer for 100% greater Maneuverability, and exclusive "swing that rear-end" Controlled Traction for moving more material, farther and faster, the "88-H" Power Grader, with its four driving wheels (4x4), and the new Super "88" Power Grader, with its six driving wheels (6x6), will OUTPERFORM ordinary rear drive, front steer motor graders, definitely and completely.

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NEW LISTINGS (Cont.)

Engineering Data on Gas Safety Equipment

343. P.F.T. Gas Safety Equipment for Controlled Digestion is the subject of an excellent 12-page bulletin issued by Pacific Flush Tank Co., Chicago 13, Ill. Full engineering data on flame traps, pressure releases, waste gas burners and related equipment is provided in convenient form. Requests for this valuable booklet must be made on business letterhead.

Design Manual for Welded Wire Reinforcement

344. Full engineering data on welded wire fabrics and applications in reinforcing pavements and all types of concrete structures is presented in an authoritative 28-page booklet made available by the Wire Reinforcement Institute, Inc., National Press Bldg., Washington 4, D. C. Get your copy of this valuable reference manual by checking the coupon.

Permanent Signs and Markers For All Purposes

345. Permanent cast aluminum street signs and markers of all types are described in a 32-page illustrated booklet available from Lake Shore Markers, 654 West 19th St., Erie, Pa. Get full information on these distinctive markers, furnished in lifetime aluminum, plain or reflectorized finish, by checking the coupon.

Data on Valves for Backflow Protection

346. Automatic protection against backflow in sewer lines is provided by hydraulically controlled PECO sewer valves, described in a folder available from PECO Valve Sales, 309 Communipaw Ave., Jersey City 4, N. J. Special design features prevent clogging of valve seat with debris. Check the coupon to get full data.

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33. A variety of Clow products for installation and repair of cast iron pipe lines, including the Eddy cutting-in valve and sleeve, split sleeves for pipe repair, test plugs, valve boxes, Strickler pipe cutters and other fittings and accessories are featured in literature available from James B. Clow & Sons, Inc., Box 6600-A, Chicago 80, Ill. Check the coupon.

What's Your Digging Problem? Repair Work? Trenches? Footings?

35. At today's prices, hand digging means the job will be costly. You can dig through asphalt and macadam, work fast and efficiently even in cramped areas with the tractor mounted Sherman Power Digger. From one position you can reach to dig 10 feet behind tractor in 140° arc and to depth of 8 feet. For full details check the coupon. Sherman Products, Inc., Royal Oak, Mich.

Helpful Data on Water Works Products

49. A completely new catalog covering the entire line of water distribution and service products offered by the Mueller Company, of Decatur, Ill., is now available to engineers and water works superintendents. The 328-page catalog features an easy-to-use sectional indexing arrangement to facilitate quick reference to any of the hundreds of products listed. A large section of useful engineering information is included. Check the coupon today.

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American water meters described in Bulletin No. 50 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Get your copy by checking the coupon.

Useful Design Data On Clarifiers

65. Designers and engineers will find a wealth of helpful information on Dorr Clarifiers for water, sewage and industrial waste treatment in an attractive bulletin issued by the Dorr Co., Stamford, Conn. Units for round and square tanks in diameters from 12 to 200 ft. are fully specified and illustrated. Check the coupon for your copy.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal, control of certain tastes and odors, plus other aids in high quality water production. Check coupon for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

Water Conditioning Data Book Offered To Engineers

259. All engineers and municipal officials concerned with water conditioning will want a copy of the greatly enlarged edition of the popular Permutit Data Book prepared by the Permutit Co., 330 West 42nd St., New York 36, N. Y. This completely revised book presents a compilation of 78 tables, all valuable to the engineer. Subjects include hydraulics, impurities in water, reactions and conversions of chemicals used in water treatment, alkalinity relationships and other helpful material.

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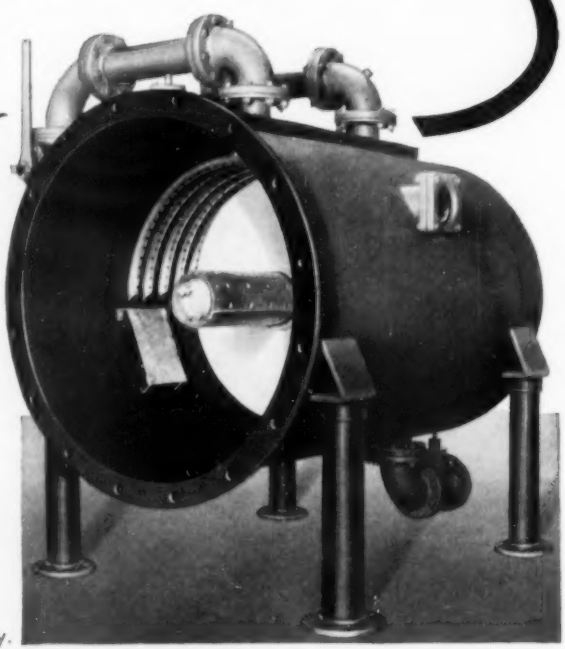

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Repair bills (materials and labor) were carefully logged on each of the 26 Buffalo-Springfield 3-Wheel Rollers used on all types of highway construction and maintenance in a large Eastern state. One of these rollers was in constant use for 12 years. Its total repair bill *for the entire period was less than $200.* That's an average of $16.39 per year! Only 4 rollers averaged over $30 per year for repairs. (Highest was $45.26 per year.)

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However, savings in repair bills are only a small part of the story. A key piece of equipment that breaks down can hold up an *entire job*, can cost tremendous sums in lost job-time, lost man-hours.

That's why you pay a little more to have Buffalo-Springfield high quality and fine engineered design. One breakdown *that didn't happen* can more than offset the higher initial cost.

Judge for yourself! How much did you pay for repairs last year? More than $20 per roller? How much did down-time and lost man-hours cost you? How many jobs were delayed by equipment that failed? Study the record of these 26 Buffalo-Springfield Rollers and compare.

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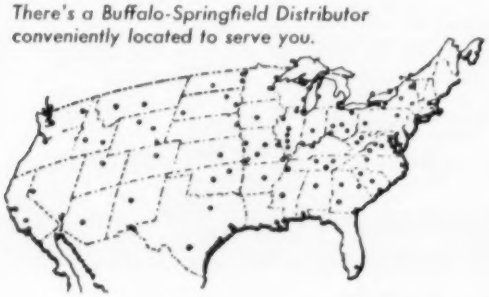

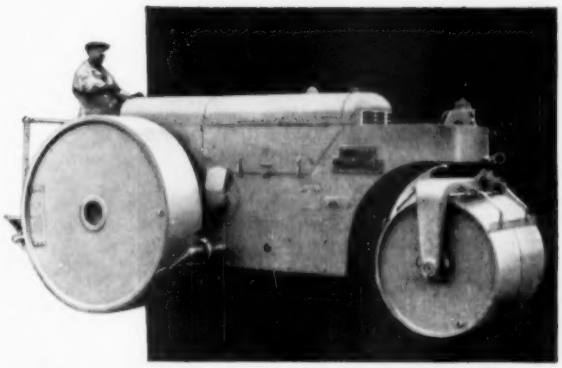

This is the Buffalo-Springfield 3-WHEEL ROLLER.

Heavy-duty engineered for continuous service on toughest jobs. Features that give you wide job versatility . . . Exclusive 4-speed transmission to provide a continuous range of roller speeds from 1.1 to 5.0 mph, all at full engine power. Machine-finished ballast-type rolls. High-speed, low-torque clutches for even, smooth reversing. Many more. Models for weights from 5 to 15 tons. Ask for Bulletin S-60-50.

Exact Repair Costs (Materials and Labor) for Each of the 26 Rollers:

ROLLER No.	YEARS ON THE JOB	TOTAL REPAIRS (MATERIAL & LABOR)	AVERAGE REPAIR COST PER YEAR
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2	3	8.00	2.66
3	5	36.24	7.24
4	8	109.90	13.73
5	4	28.75	7.18
6	4	15.65	3.91
7	6	125.82	20.97
8	7	135.50	19.35
9	4	72.10	18.02
10	7	132.08	18.87
11	9	195.82	21.75
12	9	190.40	21.15
13	7	168.14	24.02
14	7	169.59	24.22
15	7	79.37	11.33
16	7	264.80	37.83
17	6	67.35	11.23
18	7	192.92	27.56
19	7	246.69	35.24
20	7	147.04	21.00
21	8	134.59	16.74
22	5	20.43	4.08
23	7	181.12	27.88
24	7	118.50	16.65
25	7	316.88	45.26
26	12	196.79	16.39
	175*		$509.90 or $19.61 per roller

* Average almost 7 years on the job per roller.

See your distributor for complete information or write —

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BUFFALO SPRINGFIELD THE STANDARD OF COMPARISON
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THE LEADER IN ROAD ROLLER DESIGN AND MANUFACTURE.

Now's the time to mail this month's Reader's Service card.

To order these helpful booklets check the coupon on page 42.

Inexpensive Ditcher Handles Heavy Digging

91. The Shawnee Scout Ditcher, a new, heavier model for extensive digging has been added to the Shawnee line of ditchers and dozers. All models are designed to handle ditching and backfilling operations quickly, efficiently and at low cost. Full information on this equipment will be sent by Shawnee Mfg. Co., 1947 N. Topeka, Topeka, Kansas. Just check the coupon.

Discussion of Ranney Method For Municipal Water Production

116. A very interesting study of municipal and industrial water supply problems and a complete discussion of Ranney Collectors for water production will be found in a 20-page booklet published by Ranney Method Water Supplies, Inc., Box 277, Columbus 9, Ohio. Water quality, construction methods, costs, performance and other topics are considered. Check the coupon to get your copy.

Pipe Detector Determines Exact Location and Depth

120. Determination of the exact location and depth of buried pipes, valves, service cables and other metallic objects can save costly digging and unnecessary damage. Your work can be speeded when you use the Detectron pipe detector, which features simple operation, shielding to avoid static interference, economical unit construction and a lifetime guarantee. Get full data from Detectron Co., 5631 Cahuenga Blvd., No. Hollywood, Calif., by using the coupon.

Reference Catalog for Valves, Fittings and Hydrants

125. Complete data on gate valves for all services, operating accessories, check valves, fire hydrants and related specialties plus a reference section of useful engineering data is contained in Catalog H-1 issued by Rensselaer Valve Co., Troy, N. Y. All engineers who specify valves, fittings, and hydrants should have this valuable catalog for ready reference. Check the coupon.

96 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of "H control and description of comparators, colorimeters and similar devices. A 96 page booklet. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from 2½" to 14½" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydrauger Corp., 581 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered.

Engineering Data on Diatomite Filters

139. Get complete data on the Sparkler model SC-J diatomite slurry feed filter for swimming pools from the Sparkler Mfg. Co., Mundelein, Ill. Check the coupon for full information including table of filter sizes and capacities, space required and filter operation.

Faster Pipe Laying With Precaulked and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and precaulked bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WI-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

How to Design Chemical Feed Systems

179. In a 12-page booklet published by Proportioneers, the many factors which enter into the design of a chemical feed system are discussed, and the types of systems used described in detail. These include dry feed, both volumetric and gravimetric and solution feed of the decanter and positive displacement pump types. Feeder controls are considered in detail. Send now for File No. RP-9080 by checking coupon. Proportioneers, Inc., Providence 1, R. I.

Locate Mains and Services Without Digging

186. A 16-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes and valves by electronic means. Proper manipulation also determines depth of cover. Battery operated unit is readily carried by one man. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co, Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the coupon.

Indicating, Recording and Totalizing Meter

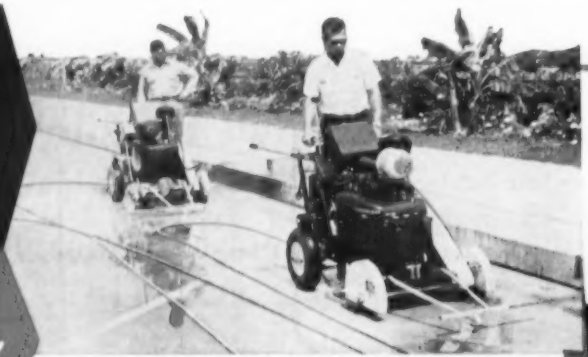
218. For accurate measurement of water, gas, air, sewage, sludge, etc., the Simplex Valve & Meter Co., Philadelphia 42, Pa., has developed the Type H-Meter. This mercury flow type indicating, recording and totalizing unit operates in conjunction with Venturi tubes, flow nozzles and orifice plates. Full description of this meter and installation data in comprehensive Bulletin 401, available by checking the coupon.

FELKER DI-MET MODEL 252

CUTS MORE FEET PER DAY!

LENGTHENS BLADE LIFE!

LOWER COST-PER-CUT!



MAKES MORE FOOTAGE PER DAY. Model 252 is SELF-PROPELLED! Cuts faster, requires no tiresome pushing on long straight-a-way-cuts! Eliminates frequent rest periods and loss of footage!

DIAMOND BLADES LAST LONGER — Smooth, uniform travel eliminates sudden bumps, jolts, side deflections and similar causes of diamond wheel damage. Field reports show up to *DOUBLE* the life from your diamond wheels!

HUSKY, SELF-STARTING 13.5 HORSEPOWER ENGINE — Standard equipment. Also available with 26 h.p. engine (illustrated) for deep cutting with large wheel sizes. CUTS 7 INCHES DEEP with 18" blade! Uses any blade diameter between 10" and 18".

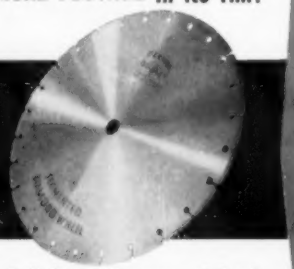
RIGHT OR LEFT HAND OPERATION — Spindle uses diamond wheel on either end.

HYDRAULIC LOWERING AND RAISING MECHANISM eases blade into and out of cut, minimizes blade shock.

WORKS CLOSE TO WALLS, CURBS, ETC. Special hinged blade guard lifts up, exposes wheel for close-up jobs.

Other concrete cutter models available. Ask for literature or see your local DI-MET dealer!

DI-MET
SEGMENTED TYPE
the DIAMOND BLADE with MORE FOOTAGE in its rim!



Built in a wide range of bond variations to deliver peak performance on your individual job! The right bond means longer life, lower cost-per-cut! Specify DI-MET Segmented Type.

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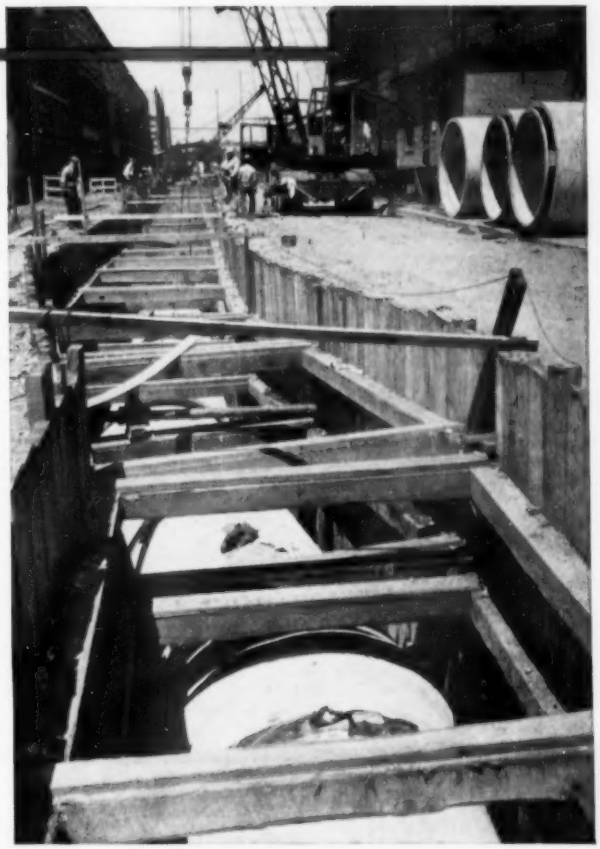
FELKER MANUFACTURING CO.
TORRANCE, CALIFORNIA

WORLD'S LARGEST AND OLDEST MANUFACTURER OF DIAMOND ABRASIVE CUT-OFF WHEELS AND MACHINES

Wilmington Whips "Wet Ditch"-Weak Soil Conditions

WITH TYLOX *flexible-rubber* JOINTS



A WET ditch plus ground conditions so poor that tight sheeting and extra bracing had to be used all along the line made the Wilmington main trunk sewer a tough proposition.

The city wanted a line that would last; the engineers wanted tight joints; the contractor wanted fast, positive coupling. How to get all three under the existent conditions was a real problem.

The problem was answered—effectively and economically — with TYLOX JOINTS — the flexible rubber joints that make lines "leak-proof for life."

TYLOX gaskets did the job and did it well. Despite the "wet ditch," the contractor found them simple to snap on the pipe — quick to couple. The engineers found the joints tight — yet flexible enough to compensate for shifting soil. And, the city will find that the TYLOX coupled line will last. Tylox rubber couplings have an established reputation for long life.

Why not learn more about TYLOX, today? Learn how you can be sure of a tight joint — with the right joint — with TYLOX.

THUMBNAIL FACTS ABOUT THE WILMINGTON JOB

Location: Along the Delaware River at Wilmington, Del.

Pipe: T & G reinforced concrete pipe supplied by the United States Concrete Pipe Co., Cleveland, Ohio.

2530'—78" bore—8' lengths	30'—42" bore—8' lengths
4260'—72" bore—8' lengths	20'—24" bore—4' lengths
2420'—66" bore—8' lengths	1570'—18" bore—4' lengths
30'—60" bore—8' lengths	30'—15" bore—4' lengths

Contractor: J. H. McILLVAINE

Engineers: WHITMAN, REQUARDT & ASSOCIATES

MAKING JOINTS WITH TYLOX RUBBER GASKET IS AS SIMPLE AS ABC

Cement tongue and snap on Tylox gasket. Lubricate sliding surfaces with Tylox Cement. Shove the pipe home.

Write, wire, or phone for specification and data on TYLOX Gaskets 1737

HAMILTON KENT MANUFACTURING CO.
KENT, OHIO
427 W. Grant St. ORchard 3-9555

"THE ONLY PERMANENTLY TIGHT LINES ARE LAID WITH RUBBER JOINTS"

To order these helpful booklets check the coupon on page 42.

What You Should Know About Meter Setting and Testing Equipment

166. Complete details on all equipment and proper methods for meter testing and installation are included in an excellent book published by Ford Meter Box Co., Wabash, Ind. All waterworks men concerned with setting and testing of water meters should have a copy of this book. Write for Catalog No. 50.

Now Every Municipality Can Own a Trencher

173. The low cost of the Blackhawk Trench Hog, a tractor-mounted ladder type trencher makes it profitable for many municipalities to own their own trencher. Be sure to investigate this versatile machine which digs trenches to 8 feet deep, 20 inches wide. Illustrated bulletin available from Arps Corp., New Holstein, Wis. Just check the coupon.

Engineering Data On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking coupon.

Pre-Cast Filter Bottoms For Water Treatment Plants

217. Construction information on the Wheeler Filter Bottom, pre-cast type, for water treatment plants is offered by Builders-Providence, Inc., 345 Harris Ave., Providence 1, R. I. Illustrated Bulletin Sup. 700-K2 gives the details you need for planning and construction. Check the coupon for a copy.

Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the work goes twice as fast. Two models, for pipe up to 2" dia. Get full details by checking the coupon. Trojan Mfg. Co., 1114 Race Dr., Troy, Ohio.

Helpful Data On Pipe Tools

230. Toledo drop head ratchet threaders are light, compact, ideally suited for work in tight corners. Three models for ¼" to ¾"; ½" to 1¼"; and ½" to 2" pipe all feature quick change of sizes. Get Catalog 11a52 from Toledo Pipe Threading Machine Co., Toledo, Ohio. Check the coupon.

Helpful Valve Catalog For Engineers

236. For complete descriptions of Darling double disc, parallel seat gate valves be sure to get Bulletin 5002 issued by Darling Valve & Mfg. Co., Williamsport, Pa. Construction details covering all valve parts and accessories are helpful for specification writers. Check the coupon for your copy.

Efficient Underdrains for Rapid Sand Filters

239. Be sure you have engineering data on vitrified clay underdrains, efficiently designed for filtering and backwashing. Check the coupon or write F. B. Leopold Co., Inc., Dept. PW, 2413 W. Carlson St., Pittsburgh 4, Pa.

Complete Booklet on Pipe Line Equipment

246. Equipment for all types of jointing, maintenance and repair jobs on water, gas and sewer lines is described and illustrated in Catalog No. 25 issued by Joseph G. Pollard Co., New Hyde Park, N. Y. Leak detectors, pipe finders, melting kettles, cleaning tools and a full line of hand tools for water and sewer departments, and many other items are included. Be sure to get your copy now. Just check the coupon.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in a convenient booklet offered with the compliments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the coupon.

Attractive Bulletin Features Large Elevated Tanks

252. In a 24-page booklet, "Horton Elevated Steel Tanks of Large Capacity," Chicago Bridge & Iron Co., Chicago 4, Ill., describes the advantages of using large elevated steel tanks to provide gravity pressure in municipal water systems. Detailed information on radial-cone tanks of 500,000 to 3,000,000-gal. capacity and Horton-spheroidal tanks of 1,000,000 to 3,000,000 gal. is included in this really handsome bulletin. Check coupon for your copy.

Inexpensive Crane For Water Department

261. Handling pipe, hydrants and valves; form pulling; and many other jobs that require a light-weight, economical crane can be solved with the versatile Pitman Hydra-Lift, an inexpensive crane that fits on the frame of any 1½ ton or larger truck. Get the full story by checking the coupon. Pitman Mfg. Co., 300 W. 79th Terr., Kansas City, Mo.

Technical Bulletin on Solenoid Operated Valves

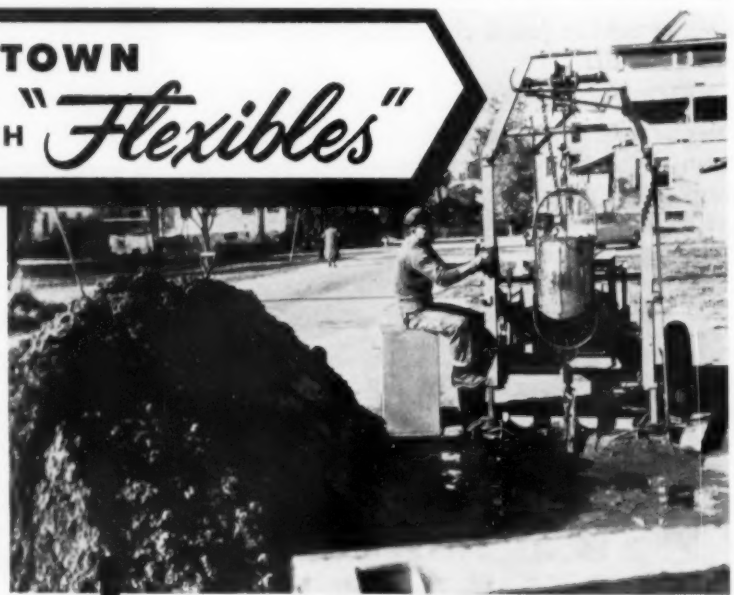
288. Full technical data on applications, construction, dimensions and specifications of Golden-Anderson Cushioned solenoid operated valves is contained in Bulletin W-7, available from Golden-Anderson Valve Specialty Co., 1232 Ridge Ave., Pittsburgh, Pa. Selected valve patterns are offered in ½ to 2 in. and 2½ to 36-in. sizes. Get all the details; just check the coupon.

Factors to Consider in Elevated Tank Selection

299. Details on the several different types of elevated steel tanks, including capacity ranges, tank dimensions and other factors to be considered in the selection of elevated tanks for modern water storage, plus discussions of new tanks for old towers and foundations are included in Bulletin 101 of the Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. Check coupon for your copy.

Another TYPICAL TOWN

SAVING MONEY WITH "*Flexibles*"



Keene, New Hampshire, population 15,638, is another of many typical American towns that employ "Flexible" sewer-cleaning equipment. It originally purchased two "Flexible" Power Bucket Machines early in 1952. That the machines are put to good use and serve a real need is evidenced by this recent photograph showing a storm drain being cleaned . . . the pile of dirt representing a partial "haul" from one manhole. City officials primarily responsible for choosing "Flexibles," after careful comparison, are Fred E. Whitney, Superintendent of Public Works, and Earl Davis, Chairman, Public Works Committee. They recommend "Flexibles" highly.

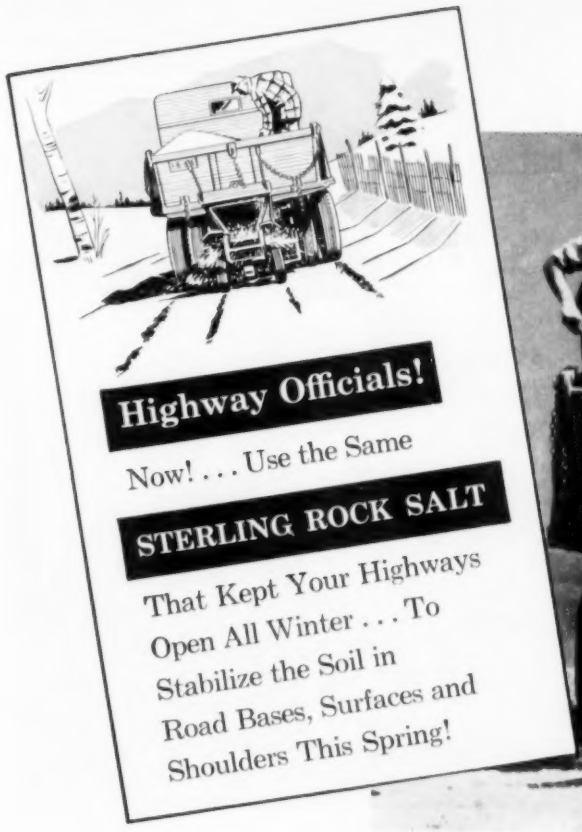
Write for our **FREE** *Catalog*

Flexible **SALES CORPORATION**

3786 Durango Ave., Los Angeles 34, Calif.

(DISTRIBUTORS IN PRINCIPAL CITIES)

AMERICA'S LARGEST LINE OF PIPE CLEANING TOOLS AND EQUIPMENT



Highway Officials!

Now! . . . Use the Same

STERLING ROCK SALT

That Kept Your Highways Open All Winter . . . To Stabilize the Soil in Road Bases, Surfaces and Shoulders This Spring!

TOUGHER ROADS! SHOULDERS THAT STAY PUT!

Stabilize the Soil and You Minimize Construction and Maintenance Costs!

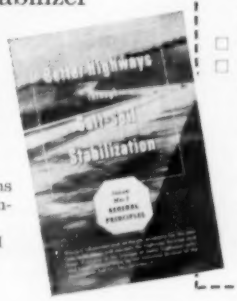
Highway soil, properly stabilized with STERLING ROCK SALT, resists both excessive moisture and extreme dryness. Granular materials are firmly anchored. Even the strong vacuum action of speeding traffic raises little dust. Precious gravel is not blown away.

Gravel roads . . . inexpensive to build and easy to maintain . . . become first class surfaces, smooth, permanent. Bases and shoulders of concrete or black-top highways do not "break up" or "separate" under weather extremes or the cruel beating of heavy trucks.

Start now, using whatever STERLING ROCK SALT you have left over from the winter. Forecast your needs and order now for spring and summer. Make sure of delivery when you need it!

"Nature's Own Soil Stabilizer"

STERLING ROCK SALT



Free! Send for these Bulletins—filled with practical, on-the-job information for roadmen . . . "BETTER HIGHWAYS THROUGH SALT-SOIL STABILIZATION"

INTERNATIONAL SALT CO., INC.
Industrial Division, Scranton 2, Pa.

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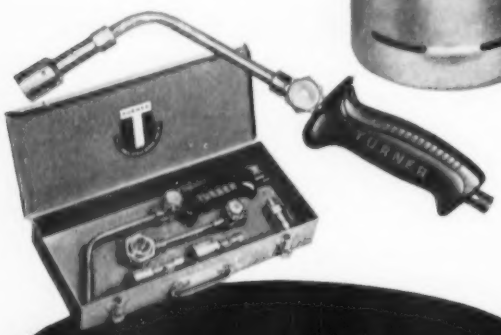
LIQUEFIED LP PETROLEUM

FIRE POTS and TORCHES

Fire pot designed for double duty service as Bench type or Tank type unit. Heavy cast iron burner — easy lighting; extremely wide range of flames; *unsurpassed for high-speed melting efficiency;* economical; burns at full tank pressure (no regulator required); gives full, solid, smooth flame which will not pop or sputter; clean — no grease, soot, smoke. Specially designed heavy-duty tanks (I.C.C. approved) available in 20-lb. and 11-lb. sizes.



Torch designed with 3 burners — needle-point, medium, large — to meet practically all job requirements. Burner heads are used interchangeably with handle tube assembly. Pistol-grip handle made of molded, heat-resistant, tough and durable rubber. All burners may be used *without* pressure regulator; easy starting — can be lighted with spark lighter or match. Easy one-hand operation adjusts flame from idle to full open. All brass construction. See your jobber . . .

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SYCAMORE ILLINOIS

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SAVES $ LOTS OF $

. . . on pipe runs under streets, highways, pavement, gardens, etc.

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HYDRAUGER*

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OPEN HOLE

AVOID TIME WASTE

Hydrauger is a modern, time-saving way to install underground pipe . . . avoids trenching, backfilling, pavement cutting, etc.

2" to 24" BITS and REAMERS

HYDRAUGER CORP. Ltd.
681 Market Street
San Francisco, California

*Earth Boring Tool

ASK FOR BOOKLET . . . NO OBLIGATION

NO "CRYSTAL BALL" NEEDED

Detectron "505" PIPE DETECTOR

takes all guesswork out of Pipe Detection

- DETECTS, TRACES and CENTERS PIPE, CABLE, ETC.
- ESTIMATES EXACT DEPTH
- SEPARATES PARALLEL PIPE, CABLE and CONDUIT

A crystal ball might be one way to locate buried pipe or cable at an excavation site. But . . . a *better, safer* and *more efficient* way is to use the new, improved Detectron "505" that accurately pinpoints the exact length, depth and location. *Stop guessing —and be sure!*

Send today for FREE Catalog No. Dept. 55

THE Detectron CORPORATION

5420 VINELAND AVE., NO. HOLLYWOOD, CALIF.

Cleaning Service for Every Type of Pipe Line

302. Flexible Pipe Cleaning Co., operating with specialized equipment and trained crews, is prepared to remove scale, rust and other deposits from pipes for every type of service. For details and estimates furnished without obligation write Flexible Pipe Cleaning Co., Box 167, Los Nietos, Calif. or check the coupon.

Chemical Feed Pump For Chlorinating and Fluoridation

322. For complete data on a heavy duty, positive displacement, diaphragm type pump for accurate feeding, chlorinating and fluoridation solutions, get Bulletin PM 20 issued by Precision Machine Co., 5 Union Sq., Somerville 43, Mass. Use the coupon today.

Convenient Data on Water Works Fittings

327. Complete data on water works brass goods and allied fittings, including curb stops, corporation stops and couplings, lead goosenecks, meter fittings, service boxes and drilling and tapping machines is furnished in convenient form by Hays Mfg. Co., Erie, Pa. Be sure you have this information in your files. Check the coupon.

Helpful Data on Water Meters

330. It is to the interest of every water works superintendent and engineer to have full data on dependable Badger water meters and related meter products. Complete data on all types of disc, turbine and compound meters, meter test equipment, yokes, strainers and alarm registers are supplied in an attractive binder by Badger Meter Mfg. Co., Milwaukee 45, Wis. Check the coupon for your copy.

●

MUNICIPAL POWER

New Advantages In Boiler Construction

309. Get the latest data on cost-saving tube-supported wall enclosures for large and small boilers from Bigelow-Liptak Corp., 2550 W. Grand Ave., Detroit 8, Mich. 12-page booklet gives full details. Check the coupon today.

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REFUSE COLLECTION AND DISPOSAL

Sanitary Landfill Operation and Methods

28. The location and area requirements for sanitary landfill, operation methods for trench type and area fills, equipment selection and costs are items discussed in an 8-page booklet issued by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. Be sure you have this reference when considering the problem of garbage and refuse disposal. Check the handy coupon today.

Increasing the Efficiency of Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the handy coupon.

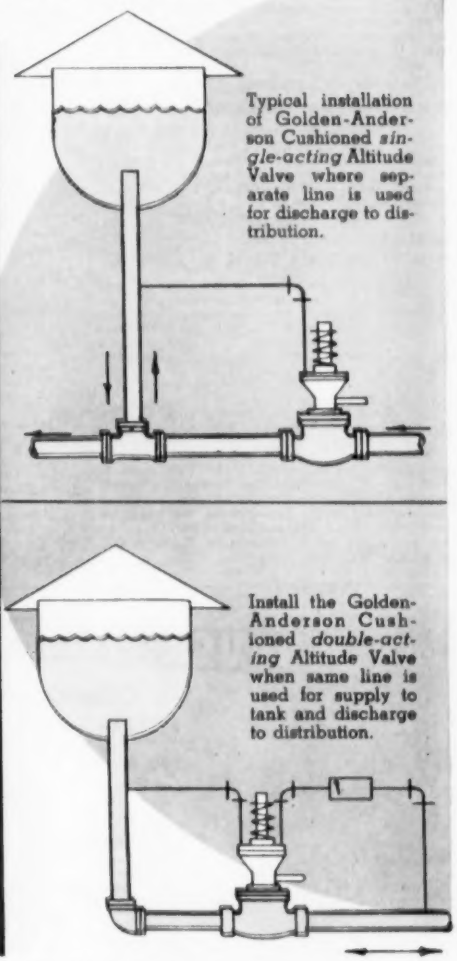
Get Latest Data On Colecto-Pak Units

243. A feature-packed, two-color bulletin telling all about the Colecto-Pak garbage collection unit has been issued by the Heil Co., Milwaukee, Wis. Action photos and cutaway views show the ease of loading and unloading and illustrate the effective compacting arrangement that means bigger loads and lower costs. Get the full story by checking the coupon.

GOLDEN ANDERSON

AUTOMATIC *Cushioned* ALTITUDE VALVES

Assure Accurate Water Level Control Under any Climatic Conditions!



Typical installation of Golden-Anderson Cushioned *single-acting* Altitude Valve where separate line is used for discharge to distribution.

Install the Golden-Anderson Cushioned *double-acting* Altitude Valve when same line is used for supply to tank and discharge to distribution.

Golden-Anderson Altitude Control Valves require no floats or complicated fixtures, can be quickly and easily installed, either above or below ground, and maintain water levels in reservoirs and tanks within 3" to 12" variation.

Write for bulletin W-4—it contains the technical facts you want to know.

GOLDEN ANDERSON *Valve Specialty Company*

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DESIGNERS AND MANUFACTURERS OF:

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STREETS AND HIGHWAYS

Better Mowing and Brush Removal

30. Fast, versatile Wood rotary mowers are available in seven models to suit all types of municipal maintenance. Upkeep costs for roadside mowing, brush cutting, leaf mulching, park maintenance can all be reduced with efficient equipment. Get full details by checking the coupon. Wood Bros. Mfg. Co., Box 148B, Oregon, Ill.

Do You Have Complete Black Top Equipment Data?

41. In 36-page catalog AA a full line of maintenance is covered. Units described and illustrated include several models of pressure distributors, supply tanks, sprayers, brooms, asphalt kettles, portable rollers, and accessory Cincinnati 2, Ohio.

Safety Lantern With Pencil Beam Signal

70. Get information on the Dietz "Night Watch" Safety Lantern with special globe design that saves fuel by intensifying light rays into a pencil beam. Full details available from R. E. Dietz Co., Syracuse, N. Y. Just check the coupon for full data.

Uniform Salt and Cinder Spreading at All Speeds

93. Be sure to investigate the hydraulically operated ground drive offered by Baughman to give you the advantages of two drive speeds and uniform distribution of material regardless of truck speed, but without the need for power takeoff or transmission. Full data on this and many other features in Form A-380. Baughman Mfg. Co., Jerseyville, Ill.

Booklet Helps Design of Custom-Engineered Steel Buildings

110. Custom-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful 32-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Use the coupon or write to Butler Mfg. Co., Kansas City, Mo.

A Helpful Booklet For Those Who Build and Maintain Roads

310. "Governmental Graders," a booklet published especially for the 18,000 governmental agencies with jurisdiction over local-rural roads tells how the three sizes of "Cat" motor graders do the job on road building and maintenance programs. Of particular interest is a table of repair costs compiled from public records. Get your copy from the Caterpillar Tractor Co., Peoria 8, Ill., or by checking the coupon.

Cut Resurfacing Costs With Manhole Adapters

137. There is a WB "Manhole Adapter" to fit every street opening and for varying elevations to suit your resurfacing job. Be sure to check this way to maintain structural strength, reduce traffic interference and save time and labor. Get full data from WB "Manhole Adapter", 1320 McGee St., Kansas City 6, Mo. Check the coupon.

How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept. PW, Warren, Ohio.

Black-Top Paver Offers Many Advantages

150. The flexible Adnun Black Top Paver lays any asphalt mix, hot or cold, in widths from 6 ft. to 13 ft. Careful design lowers operating cost and cuts maintenance. Attachments spread stone, cinders or slag. Get full data on this machine by checking coupon. The Foote Co., 1954 State St., Nunda, N. Y.

Soil-Cement Information: Short-Cut Testing Procedures

159. A 12-page booklet entitled "Short-Cut Soil Cement Testing Procedures for Sandy Soils" is now available from the Portland Cement Assn., 33 W. Grand Ave., Chicago 10, Ill. Charts in the booklet are planned to reduce laboratory work for the scientific testing and control procedures developed by PCA. Get your copy by checking the coupon.

Versatile Maintainer Has Year 'Round Usefulness

151. The sturdy Huber Maintainer will work for you the year 'round on maintenance jobs, berm leveling, road planning, bull-dozing, snow plowing, brooming, mowing shoulders and as a patch roller. Good ideas on how to do all these jobs in Bulletin No. M-138. Write Huber Manufacturing Co., Dept. PW, Marion, Ohio.

8 Reasons Why You Should Check the Jaeger Loader

207. In a profusely illustrated 16-page catalog devoted to the applications and special design features of the Jaeger "Load-Plus" tractor-loader unit, eight good reasons listed to back up the claim that this machine outproduces any other loader of its size. These include load capacity, balance, reach, maneuverability, automatic power adjustment by torque converter, instant reversal, multiple speed and ease of control. Check them all by getting a copy of Catalog L100-3. Check the coupon today. Jaeger Machine Co., 400 Dublin Ave., Columbus 15, Ohio.

HAUCK Presents
COMPOUND MELTING FURNACE
Thawing Burner Equipment
Double Jacketed Rubber and Asphalt Furnace
Compound Melting Furnace
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Asphalt Tool and Cement Heater
Asphalt and Tar Melting Kettles
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For all kinds of sewer and water pipe jointing compounds, pipe line protective enamels, asphalt, tar and pitch. "Slide rail" torch burner equipment gives accurate heat control. Burns kerosene, furnace oil or bottled gas. Compact; built for tough service; easily portable. Built in 8, 15 and 25 gal. melting pot capacities. Write for Bulletin.
HAUCK MANUFACTURING CO.
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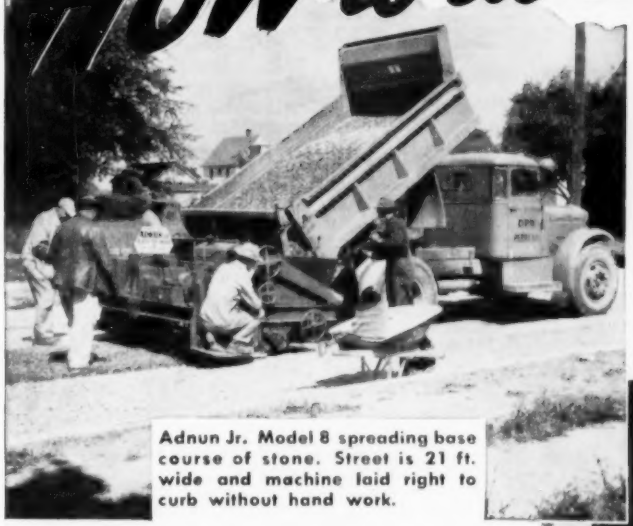
VERSATILITY is the keynote in SHAWNEE EQUIPMENT
FROM THIS TO THIS IN MINUTES
• Long Trenches 9½ ft. deep
• Loading
HYDRO-CLAM CONVERTS TO BACKHOE SIMPLY BY CHANGING BUCKET BOOMS
Ideal for large and small operators—Municipalities and Counties.
AVAILABLE FOR MOST ALL TRACTORS—One machine...convertible to perform two types of digging! This practical feature was first requested by owners of Shawnee equipment—Now it is fulfilled. It means greater economy and increased versatility—from digging long trenches 10" to 20" wide the machine can be converted to the clam for spot excavations (36-in. minimum) in just a few minutes time.
• Spot Excavations 8½ ft. deep
• Digs Straight Down
• Loading
HYDRO-CLAM AS BACKHOE
HYDRO-CLAM WITH CLAM
Write for specifications and name of your dealer.
SHAWNEE Manufacturing Co., Inc.
1947-L N. TOPEKA
TOPEKA, KANSAS

HOW to do a BETTER JOB of STREET PAVING



Adnun Jr. Model 8 spreading base course of stone. Street is 21 ft. wide and machine laid right to curb without hand work.

THE NEW ADNUN JR MODEL 8 BLACK TOP PAVER

HERE is a street job in New York State. The Adnun Jr. handled all of the spreading on this from stone base to finished top course. The Adnun Jr. is a highly engineered, quality, precision, tow-type paver that is far superior to the usual hopper on wheels now being used for non-specification work. The advantages of the Adnun Jr. assure greater accuracy in course thickness, improved density and better joints with a material reduction in hand work.

Its ability to maneuver without load saves time on relocations. The powered Breaker Bar in the Hopper assures better compaction. The Oscillating Toothed Cutter Bar, with overlapping action, cuts the course off at the right thickness without troweling fats to the surface and makes a tighter joint without hand work. A smooth course surface which approaches that of larger pavers, results from the Adnun principle of Continuous Course Correction.

These are only a part of the long list of Adnun Jr. advantages in performance and design. You should know all about them. Let us send you a folder on it today.

After stone course was shot with oil, Adnun Jr. laid the asphalt surface in two courses in 7 ft. sections. The machine is here laying the binder.

The Adnun Jr. is easily moved. A removable Trailer Hitch permits lifting the unit with the truck body hoist and towing it anywhere with the paver rolling on its own front wheels.

ADNUN JR MODEL 8

BLACK TOP PAVER

BLAW-KNOX COMPANY
FOOTE CONSTRUCTION EQUIPMENT DIVISION
1954 State Street,
HUNDA, NEW YORK

BLAW-KNOX

Get full details of this month's products . . . mail your Readers' Service card today.

To order these helpful booklets check the coupon on page 42.

How To Build Stabilized Heavy Traffic Pavements

233. A 16-page booklet published by Seaman Motors, Inc., Milwaukee, Wis., shows how low cost, local materials may be utilized in the construction of heavy duty pavements. Many illustrations and well-written text give full instructions on materials and construction methods for subgrades, subbases and base courses. A worth-while booklet for every highway engineer. Check coupon for copy.

Easier Street Sweeping With Wilshire Municipal Sweepers

306. A handy chart included in a comprehensive 20-page bulletin enables you to check your street sweeping costs against the man-hour savings of all Wilshire power sweeper models. Other helpful information shows all details on sweepers for large and small communities. Get this illustrated bulletin by writing Wilshire Power Sweeper Co., Glendale 4, Calif., or check the coupon.

What A Road Roller Should Give You

325. Many engineering design features that make Buffalo-Springfield rollers the answer to your needs are described in an attractive bulletin covering the C-Model Two-Axle Tandems of Buffalo-Springfield Roller Co., Springfield, Ohio. Included are details on open gridwork for better operator visibility, increased ground clearance and bevel gear drive. Investigate these and many other features listed in Form No. S 61-53. Check the coupon.

20-Page Book Shows All Snow Plow Features

313. The full line of Ross snow plows, including one-way "Rigid" types, trip moldboard plows, Vee plows, snow wings, sidewalk plows and plow hitches, hydraulic controls, plus spreaders for ice control are featured in a profusely illustrated booklet issued by the Burch Corp., Crestline, Ohio. Be sure to get this comprehensive booklet and review your plow requirements. Check the coupon.

Speed Concrete Removal And Make Better Patches

202. Felker self-propelled concrete cutters saw to 6½" depths to facilitate concrete removal and produce smooth, straight edges which resist spalling when patched. Full data on cutters and segmented type diamond abrasive wheels are available from Felker Mfg. Co., Torrance, Calif. Check the coupon today!

Give Full Protection To Treated Poles and Timbers

267. Bolt holes in treated poles and timbers used for guard rails and structures can easily be the first point of decay. Now you can assure maximum life by using the Greenlee Bolt Hole Treater, a simple device that forces preservative into the wood cells. Bulletin 13-15 gives the details. Greenlee Bros. & Co., Rockford, Ill.

Design Data on Universal Concrete Cribbing

274. Complete information on concrete cribbing for embankment retaining walls, bridge abutments, highway underpasses and other structures will be found in a new bulletin issued by the Universal Concrete Pipe Co., 297 S. High St., Columbus, Ohio. Check coupon for free copy.

Hot or Cold Patching Mixtures Prepared on the Job

304. By preparing your patching mixtures, hot or cold, right on the job, you can use them immediately with a minimum of handling. Get full data on the McConnaughay Model HTD "Multi-Pug" Asphalt Mixer for fast, easy and economical preparation of patch materials. Write K. E. McConnaughay, Lafayette, Ind. or use the coupon.

How the Mobil-Sweeper Can Improve Street Sweeping

305. Sweeping costs can be cut with the Mobil-Sweeper which features safe highway speeds up to 55 mph, carries 2 2/3 cu. yd. dirt hopper, sweeps swath up to 10' wide with full floating brooms. Hills and deep gutters are no obstacle. Write to The Conveyor Co., 3260 E. Slauson Ave., Los Angeles 58, Calif. or use coupon for complete details on this machine.

Cut the Cost of Road Rehabilitation

332. Be sure to investigate the Hetherington & Berner "Moto-Paver," the machine that does a complete mixing and laying job in one continuous operation. Specifications and complete information on both standard and heavy-duty models is provided in Bulletin MP-53. Get your copy from Hetherington & Berner, Inc., Indianapolis, Ind., or check the coupon.

mow 'em down...
COSTS, that is...
investigate the *Anderson*
HYDRAULIC MOWER

Simple, convenient controls give instant, positive action. Smooth, vibrationless operation eliminates fatigue and costly maintenance. Parallel lift allows adjustment of cutting heights with single adjustment. Hydraulic lift of cutter bar to clear obstructions, reversible motor, easy knife change — all add up to less lost time, more mowing per day. Anderson Flow Control Valve gives constant and adjustable motor speed, eliminates overspeed. Your tractor dealer has performance records proving lower cost per mile. So many factors — longer life, reduced cost per mile, ease and safety of operating — that you should get complete specifications and performance records at once.

SEE YOUR TRACTOR DEALER

A. C. ANDERSON, INC.
WILDWOOD, NEW JERSEY

CONSTRUCTION EQUIPMENT AND MATERIALS

1,001 Profitable Uses For Holmes-Owen Loader

39. The addition of a Holmes-Owen Loader to your dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy coupon for full data. Ernest Holmes Co., Chattanooga, Tenn.

What You Should Know About Air-Placed Concrete

67. For a detailed explanation of the principle of "gunned" or "air placed" concrete and description of the improved Model 750 and 1250 Bondactors, be sure to get your copy of Form 553 from Air Placement Equipment Co., 1011 W. 24th St., Kansas City 8, Mo. Check the coupon today.

RUGGED CONCRETE PIPE WITHSTANDS THE SEVERE STRESSES OF JACKING OPERATIONS

The photo shows 84-in. concrete pipe being jacked under several railroad tracks to provide protection for a 48-in. water main of the Metropolitan Utilities District in Omaha. The entire operation was performed during the winter months without any more interference with traffic than the observance of a slow order.

It's another example of how sturdy concrete pipe meets almost any combination of site or soil conditions or drainage requirements. Concrete pipe also stands up under heavy traffic impact, high fill loads and severe climate.

You usually save money by jacking concrete pipe because you minimize roadbed disturbances under railways, highways and streets. Thus you reduce or eliminate costly maintenance often caused by trench fill settlement.

In addition to its superior strength and ease of installation concrete pipe offers:

1. MAXIMUM HYDRAULIC CAPACITY—assured by smooth interior walls, clean, even joints and freedom from damaging internal corrosion.

2. EXTRA LONG LIFE—proved by long years of dependable service in thousands of installations.

3. OUTSTANDING ECONOMY—resulting from moderate first cost, extra long life and little or no maintenance expense. These factors mean ***low annual cost***—the true measure of pipe line performance.

PORTLAND CEMENT ASSOCIATION

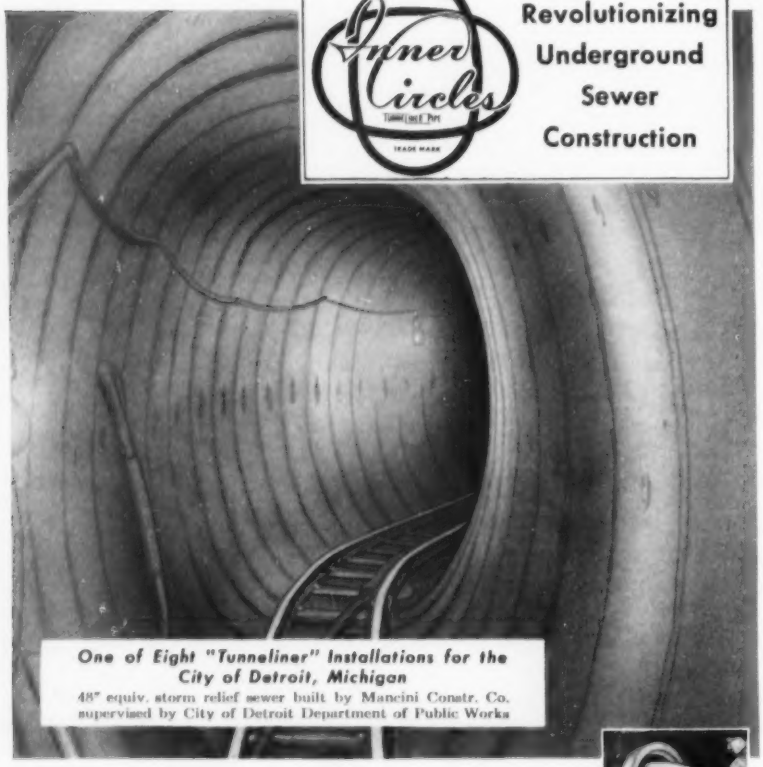
33 WEST GRAND AVENUE, CHICAGO 10, ILLINOIS

A national organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work

Now's the time to mail this month's Reader's Service card.

Now! You Can Pass PIPE THROUGH PIPE on CURVES too!

Inner Circles — Revolutionizing Underground Sewer Construction



One of Eight "Tunneliner" Installations for the City of Detroit, Michigan

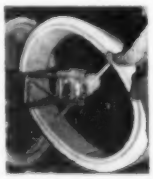
48" equiv. storm relief sewer built by Mancini Constr. Co. supervised by City of Detroit Department of Public Works

"*Tunneliner*" methods using Inner Circles precast concrete pipe, developed by Lamar, offer distinct advantages over other types of tunneling. Oval-shaped sections of full ring reinforced pipe of identical size are passed through themselves as excavation progresses to form a continuous conduit of pretested strength. This revolutionary new method of installing concrete pipe underground is aimed at solving all the difficulties encountered in tunneling.

Worker guides section of oval-shaped pipe carried through tunnel by Lamar *Tunnelugger*.

NO EXCAVATION AT SURFACE—NO TRAFFIC BLOCKED OFF —SEWER COSTS OFTEN ARE MATERIALLY REDUCED

Unskilled workers quickly learn "*Tunneliner*" methods in the first few hours on the job. Less equipment is needed, yet sewers are completed in faster time. Advantages have been thoroughly proved in tunneling through wet sand, river muck, loose rock and various clay conditions.



Section is easily tilted upright on *Tunnelugger* arm.

Sizes of "*Tunneliner*" pipe now available—33" through 72"
All necessary special equipment is furnished at a nominal rental charge.

For complete information—write, wire or telephone

LAMAR PIPE & TILE DIVISION

AMERICAN-MARIETTA COMPANY

Grand Rapids 9, Michigan

Section is turned, then seated by *Tunnelugger*.

Inner Circles "*Tunneliner*" Pipe is available anywhere in the nation through licensees or through divisions and subsidiaries of the American-Marietta Company—The Lamar Pipe and Tile Company, Concrete Products Company of America and Universal Concrete Pipe Company. 32 plants coast-to-coast.

Thousands use our Readers' Service card to keep up to date . . . do you?

Municipalities Make Equipment Dollars Go Further

55. Be sure to get your copy of "Saving Facts", an illustrated booklet prepared by The Oliver Corp. that shows how equipment dollars can be stretched on mnunicipal work. Text and photos describe the application of tractors and money-saving attachments in street maintenance, snow removal, waste disposal, pipe laying and other projects. Write The Oliver Corp., Industrial Div., 400 W. Madison, Chicago, Ill. or check coupon.

Check Your Power Needs Without Delay

68. International Harvester Company has available a folder describing its line of diesel engines and power units for all your power needs up to 180 hp. For a copy of this colorful booklet, write to International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., and ask for Form A-156-NN, or use the handy coupon and we will forward your request.

Electric Power Wherever You Need It

75. Electric power for every job—for construction, maintenance and emergencies—is always available for the owner of a convenient Homelite carryable generator. These compact, gasoline engine operated units are made in a variety of sizes to suit every power requirement. Get full details by writing Homelite Corp., Port Chester, N. Y., or check the coupon.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 99H Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision sideshift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Co., Aurora, Ill.

Excavating Machines Engineered for Performance

119. A complete line of excavating and materials handling machines in 10 to 60 ton—½ to 2½ cu. yd. capacities are offered by Osgood General, Marion, Ohio. Several bulletins give details on special features that increase efficiency and reduce maintenance. Check the coupon for full information.

Details on Motor Grader Construction and Use

312. In a handsome catalog, profusely illustrated with diagrams and photographs of unusually fine quality, the Galion Iron Works and Mfg. Co., Galion, Ohio, has presented all details on the construction and operating features of their Model 118 motor grader. This impressive 28-page catalog, No. 375, is available without charge. Just check the coupon.

Trencher Fits Municipal Needs

315. A bulletin describing the Cleveland Model 95 trencher has been published by the Cleveland Trencher Co., Cleveland 17, Ohio. The Model 95, called "The standard machine for city and suburban work", is versatile, manueverable and economical for use on water lines, service lines, road widening and all utilities trenching. Get this 8-page illustrated bulletin by checking the coupon.

The Loader That Digs Like a Power Shovel

317. The power crowder-arm of the Lessmann loader gives you power shovel advantages in this tractor-mounted unit, and enables you to fill the bucket in tough digging without spinning the wheels. Check the coupon for all the details on this rugged, heavy-duty unit. Lessmann Mfg. Co., Des Moines 4, Iowa.

Get Tough Blades and Cutting Edges For Your Construction Equipment

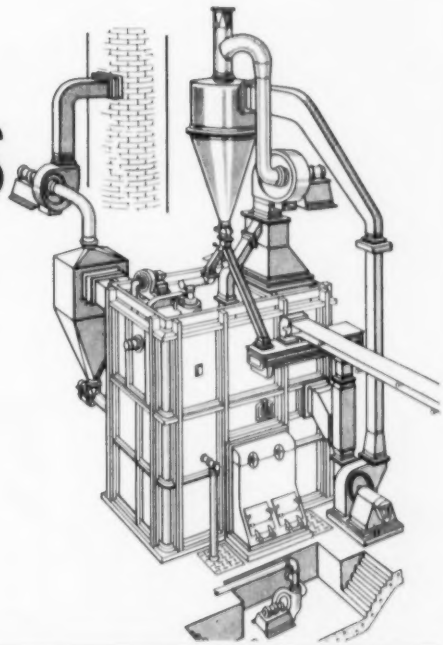
326. Controlled analysis steels used in Shunk blades and cutting edges for graders, scrapers, dozers, and snow plows means long life and wear resistance to give you more value from your maintenance dollar. Full data for ordering blades and scarifier teeth for standard and special equipment is available from Shunk Mfg. Co., Bucyrus, Ohio. Check the coupon today.

10,000 Tons of Filter Cake per Day

...the capacity of

C-E RAYMOND SYSTEMS

of Flash Drying and Incineration



The most widely used heat method of sewage sludge disposal is the C-E Raymond System of Flash Drying and Incineration. Total daily capacity of C-E Raymond Systems installed, under construction or on order is more than 10,000 tons of filter cake, based on 24-hour operation . . .

This is nearly 50% more than the total of all other heat methods.

One important reason for this marked preference for the C-E Raymond System is that it is the most widely proven method that permits the flash drying of sludge to a saleable fertilizer or its incineration to a sterile ash . . . in either case with the deodorization of stack gases if desired. No other method offers this practical flexibility.

Another reason is that the C-E Raymond System has been service-proved in actual use in communities of every size—ranging in equivalent populations from 6,000 to 3,600,000 . . . and located in all parts of the country from coast to coast.

Like the communities listed at the right, you, too, can plan to end your sludge disposal problems by the proven C-E Raymond System. For full information, just get in touch with the C-E Raymond office nearest you. A C-E specialist will be glad to help you.

B-695

C-E Raymond Systems installed, under construction or on order since 1945

Installation	Consulting Engineer
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Bloomsburg, Pa.	Gannet, Fleming, Corddry & Carpenter
Camden, N. J.	Havens & Emerson
Chicago, Ill. (W. So.W.)	City Engineering Dept.
Edgewater, N. J.	McClave & McClave
Fond du Lac, Wis.	Jerry Donohue Engrg. Co.
Galveston, Texas	Joe J. Rady & Co.
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San Diego, Cal.	Frank Currie
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Sheboygan, Wis.	Jerry Donohue Engrg. Co.
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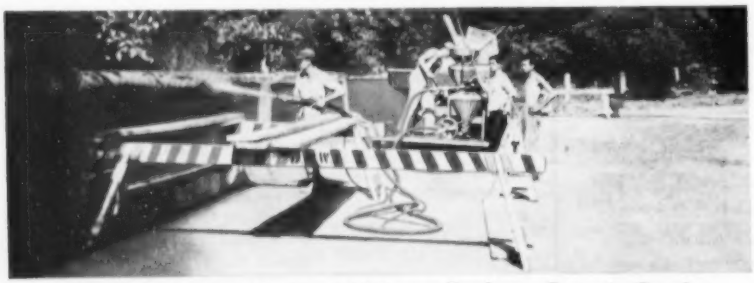
ALSO FLASH DRYING AND INCINERATION SYSTEMS FOR INDUSTRIAL WASTE DISPOSAL

Need more facts about advertised products? Mail your Readers' Service card now.

DUKE POWER COMPANY engineers concluded that the deteriorated concrete on this Morgantown, North Carolina dam could be best restored with Bondactor Concrete Gunning Equipment. Now the dam has a bonded surface, so dense that further seepage and disintegration has been halted.

AT FRANKFORT, KENTUCKY, the original stone on the Kentucky State Capitol building — was scoured and cleaned with no defacement of the finish—by wet-sandblasting with Bondactor Equipment. Bondactor equipment is also used for concrete restoration, dry sandblasting, waterproofing, insulating, stuccoing, fireproofing. It pays its way all the way!

THE STATE OF KENTUCKY is stretching its maintenance budget. Kentucky's Highway Department has a portable Bondactor rig which paid for itself in 90 days! The rig is used for restoring and maintaining the state's more than 4,000 concrete bridges. Bondactors are proved in use—in dozens of uses—by state, county and city governments.



THE CITY OF SYRACUSE, NEW YORK uses Bondactor Concrete Gunning Equipment on a portable rig which travels throughout the city maintaining and restoring the city's sidewalks, retaining walls, curbs and streets. Here's proof that you can do the same thing . . . and stretch your yearly maintenance budget to cover more repairs.

Find Out How You Can Do It Yourself With a BONDACTOR . . . and Save!

Send us your problem! State the use you have for a Bondactor and materials to be gunned. We'll send complete information. Write, wire or phone today!

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EQUIPMENT COMPANY
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Kansas City 8, Missouri

Get full details of this month's products . . . mail your Readers' Service card today.

Profitable Construction with Payloader

234. A comprehensive, 12-page catalog filled with on-the-job photos showing a wide variety of earth-moving, material-handling, lifting and carrying jobs being performed by the multi-purpose tractor-shovels known as "Payloaders" is now available. Helpful job data, specifications and features of the complete Payloader line are included, with illustrations of useful accessories. Copies of this colorful catalog No. 217 can be obtained from The Frank G. Hough Co., 761 Sunnyside Ave., Libertyville, Ill., or by checking the coupon.

Get Data on the Tractair, A "10 in 1" Machine

319. You will hold down your investment in special equipment and be ready to do 10 basic jobs on maintenance and new construction when you own a Le Roi "Tractair", the versatile combination of a 35-hp wheel tractor and 105 cfm air compressor. Be sure to investigate the unlimited usefulness of this machine. Get full data from the Le Roi Co., Milwaukee 14, Wis., or check the coupon.

CIVIL DEFENSE

Get the Facts on Air Raid Sirens

86. There's more to be considered in air raid warning sirens than the loudness of the signal. Get complete information on efficient size and spacing of sirens from Federal Enterprises, Inc., 8733 So. State St., Chicago, Ill., by using coupon.

Are You Ready Now To Make Main Repairs?

214. Broken water mains can quickly be repaired when you have "Skinner-Seal" Split Coupling Clamps on hand. Get Skinner Catalog 41 now—this handsome 40-page book shows how to make every type of pipe repair and covers a complete line of clamps to do the job quickly and easily. Just check the handy coupon for your copy. M. B. Skinner & Co., So. Bend 21, Ind.

TRAFFIC SIGNS

How Reflective Sheeting Improves Traffic Signs

157. Get full data on Grotelite reflective sheeting for smooth, brilliant, long-life traffic signs and marking devices from the Grote Mfg. Co., Bellevue, Ky. Use the handy card or coupon today.

New Reflectorized Sign Faces Refurbish Old Traffic Signs

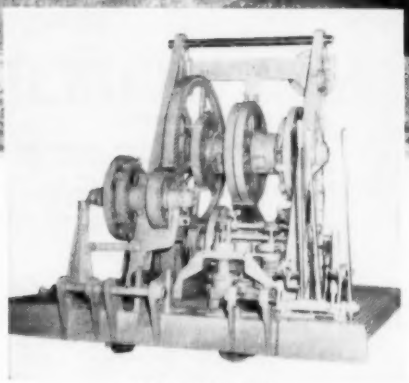
292. Get complete details on new "EZ-On" traffic signs faces ready for immediate shipments. Reflectorized faces cost only a fraction as much as new signs and are easily attached to existing traffic signs. Use the coupon for data today. Grace Sign & Mfg. Co., St. Louis 18, Mo.

SEWERAGE AND WASTE TREATMENT

A Short Course In Pipe Jointing

169. The story of rubber couplings for clay and concrete pipelines is graphically presented in the booklet "Pipe Enterprise", published by Hamilton Kent Mfg. Co., Kent, Ohio. Detailed description of pipe jointing methods; photos showing jobs where Tylox gaskets met the need for easily assembled, permanently tight joints installed under all conditions; and a report on the development, manufacture and outstanding features of the compression type gasket make this booklet valuable to every engineer and contractor. Check the coupon for free copy.

New OSGOOD ¾ YD. Machine



DECK MACHINERY

CRAWLER UNIT

OSGOOD Model 250 . . . ¾ cu. yd. 12 Ton . Shovel, Hoe, Crane, Clamshell, Dragline

Now...You can get Job-Proven OSGOOD Performance in the ¾ yd. size...at an Economical Price!

- **DECK** is rugged . . . full length, one-piece cast-steel construction . . . providing a sturdy foundation for the machinery.
- **MACHINERY** is accessible and well-balanced. Chains, gears, and bands are covered for safety and cleanliness.
- **SWING AND TRAVEL CLUTCHES** are of large diameter, with air-cooled drivers and housings.
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- **SHOVEL BOOM** . . . all-steel, reinforced and welded into an exceptionally strong unit.
- **CONVERTIBLE** to Crane, Clamshell, Dragline, or to Hoe . . . in the field. Crane boom is lattice type, with all-welded tubular lacing. Crane capacity 24,450 lbs.
- **CRAWLER UNIT** provides exceptionally stable base for superstructure . . . 22" treads standard—36" optional.

5408

OSGOOD O-G GENERAL

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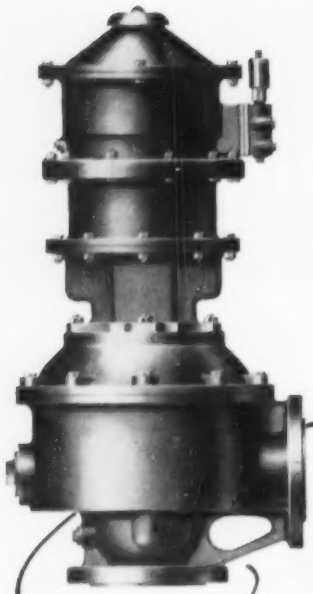

New Simplex Type CCAV Valve. Combination controlled-closing and vacuum-breaking valve.

ONE 4-INCH CONNECTION to your main pipe line...

PREVENTS { surge rupture vacuum collapse

Why take chances? No matter what the safety factor, surge and hammer can play some dirty tricks . . . rupture lines, blow out packing, fracture valves. And if the line breaks or is drained rapidly, it can collapse from vacuum.

Simplex Type CCAV is a new combination! A controlled-closing and vacuum-breaking valve to protect your lines against these dangers. It's easily installed, moderately priced, positive-acting.

When lines are being filled, Type CCAV Valve vents air to prevent binding, controls transfer time to prevent surge damage. Timing can be quickly set from a few seconds up to well over ten minutes—as dictated by site requirements. If hammer is excessive, Type CCAV automatically discharges water . . . extra protection for costly lines and fittings.

When lines are subject to collapse from rapid draining or line breaks, the Simplex CCAV acts quickly . . . breaks the vacuum for maximum safety.

WRITE FOR FREE BROCHURE

SIMPLEX VALVE & METER COMPANY
6750 UPLAND STREET, PHILADELPHIA 42, PA.

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Now's the time to mail this month's Reader's Service card.

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

How Cities Clean Sewer Lines From Street in One Operation

25. In a helpful 28-page handbook of sewer cleaning methods and equipment the makers of OK Champion sewer cleaners give full details of power and hand operated models. Also included are data on expansion buckets that take dirt from sewer to street in one operation, root cutters and other accessories. Get your copy by checking coupon. Champion Corp., 4752 Sheffield Ave., Hammond, Ind.

Complete Sanitation and Process Equipment Bulletin

40. A complete illustrated bulletin gives detailed information on all "Rex" sanitation and process equipment. 36 pages of engineering data, process descriptions, conversion factors. Get Bulletin 51-83 by checking the coupon. Chain Belt Co., Box 2022, Milwaukee 1, Wis.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete, easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 40-page booklet issued by Flexible Sales Corp., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included. Check the coupon for your copy of this helpful handbook.

Painting Water Tanks For Longer Protection

52. High labor costs demand special consideration when painting elevated water tanks. This and other factors involved in proper paint selection are discussed in a bulletin issued by Jos. Dixon Crucible Co., Jersey City 3, N. J. Helpful specifications for repainting water tanks are also included. Check the coupon today.

Effective Shredder For Dried Sewage Sludge

72. The rugged and compact Royer Sludge Disintegrator does a quick and effective job of preparing sludge for use as a fertilizer on city properties or for sale to others. Several models, portable and stationary, suitable for every size plant and power source are described in Bulletin 643-A, issued by the Royer Foundry and Machine Co., Kingston, Pa. Get a copy by checking the coupon.

Helpful Design Data For Sewage Ejectors

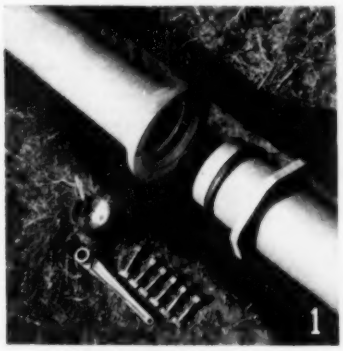
81. The applications and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking coupon.

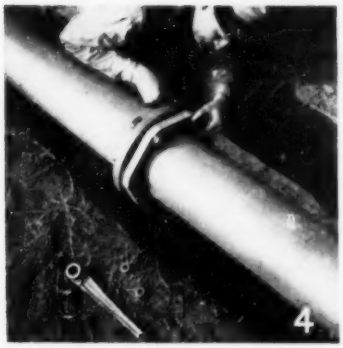
Comminutors for Automatic Disposal of Coarse Sewage Solids

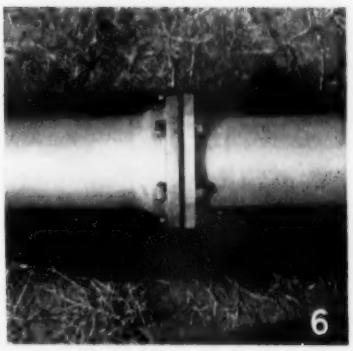
152. The problems connected with disposal of coarse sewage solids are eliminated by clean, odorless, automatic Comminutors. Full engineering data show the proper model for every size plant and furnish details of hydraulics and typical installations. Chicago Pump Co., 622 Diversey Pkwy., Chicago 14, Ill.

Helpful Data on Sluice Gates

158. In a well-organized 48-page catalog you will find complete engineering and design data on Pekrul sluice gates, headgates, automatic flap gates, lifts and accessories. Numerous models in 6" to 92" sizes are available, and all pertinent data will be found in this helpful booklet. Write Morse Bros. Machinery Co. Denver, Colo., or use the coupon.







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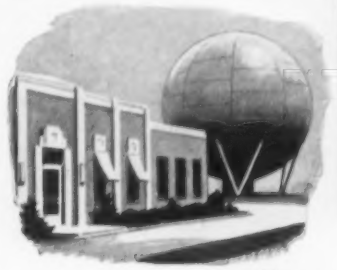

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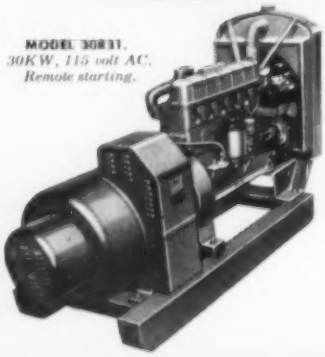

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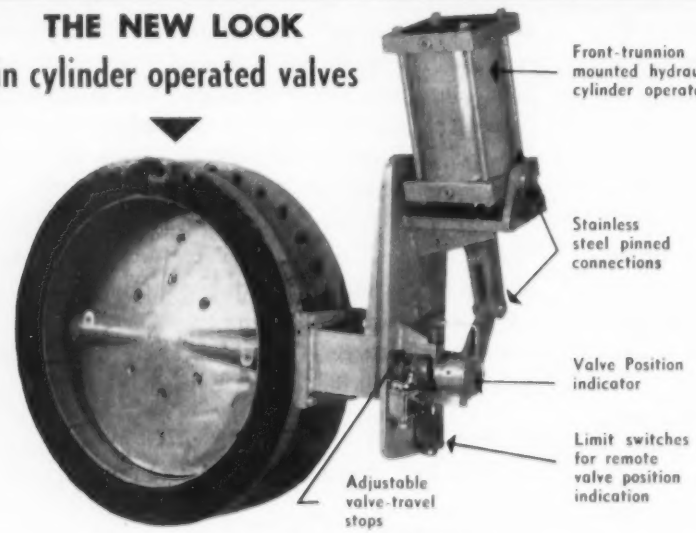
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Theory and Application Of the Flow Tube

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Data Offered On Mixed Flow Pumps

201. Data on the complete line of Worthington Mixflo pumps of the two-vane, non-clogging sewage type is offered in 16-page bulletin W-317-H16. Salient features are outlined, typical sections, performance curves and general data for five types are included. Helpful charts aid shafting selection. Copies available by using coupon or from Worthington Corp., Harrison, N. J.

How Tunneliners Revolutionize Underground Sewer Construction

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Modern Methods and Materials For Joining Sewer Pipe

227. In a compilation of reprints and related supplementary material, the Atlas Mineral Products Co., Mertztown, Pa., presents a comprehensive review of all types of sewer jointing materials and methods. You will find this interesting and informative reading. Get a copy by checking the coupon.

Efficient Blowers for Activated Sludge Plants

232. Many advantages of Roots-Connersville positive displacement rotary blowers are described in Bulletin 22-23-B-13, which also provides characteristic curves for operation with constant speed, multi-speed and variable speed motors and details of several types of blowers. Get this helpful bulletin by checking the coupon. Roots-Connersville Blower Corp., Connersville, Ind.

Data Offered on Water, Sewage and Waste Treatment Equipment

263. Equipment for sewage treatment, water purification and industrial waste treatment is described in a 16-page Book No. 2440, published by Link-Belt Co., Colmar, Pa. Case histories, photographs and schematic drawings are included. Straightline and Circuline collectors, Thru-Clean and Straightline bar screens, Tritor screens, flash mixers, scum breakers and other units are described. Check the coupon for your copy.

Reference Book on Lubricated Plug Valves

273. Lubricated plug valves, including stick-proof lever sealed valves for easy operation and positive mechanical seal are fully described in reference books issued by Homestead Valve Mfg. Co., Box 550, Coraopolis, Pa. Check the coupon for your copy.

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281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy coupon or write Combustion Engineering Inc., Flash Dryer Div., 200 Madison Ave., New York 16, N. Y.

Instrumentation and Control Equipment For Water and Sewage Plants

298. Full engineering data on the instrumentation and control equipment needed in water works, sewage plants, pumping station and related installations are provided in the "Application Engineering Data" binder issued by the Foxboro Co., Foxboro, Mass. Every engineer and designer should have this valuable material on hand. Check the coupon if you can use this data.

BOILERS

10 STORIES HIGH!

Three new B-I-G boilers on the West Coast will have all of the cost-saving advantages of B-L tube-supported wall enclosures and Texad* finishes. The order for one of them—a 1,250,000-pound-per-hour unit—has just been placed. Construction on the others—850,000-pound-per-hour boilers is now being started.

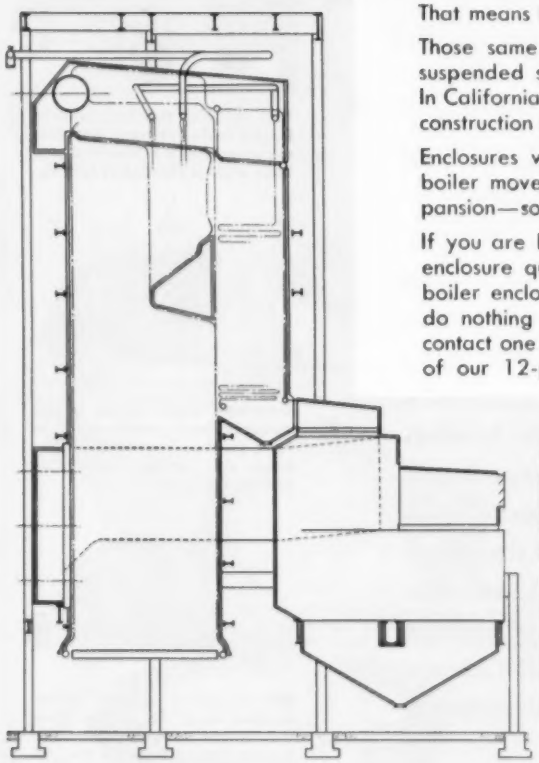
That means they'll cost less, save steel, operate more efficiently.

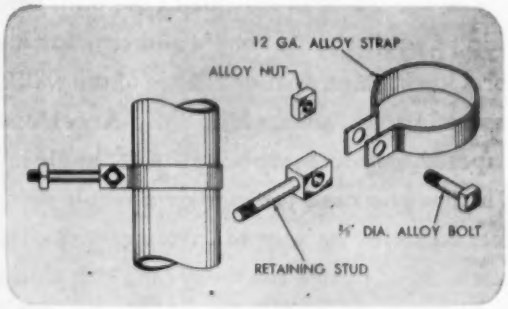
Those same advantages can be earned by specifying Bigelow-Liptak suspended settings for any large size industrial or public utility boiler. In California, for example, the king-sized, 10-story boilers will have lower construction and material costs and will not need tough-to-get steel plate.

Enclosures will be tighter, too. Tube-supported walls breathe with the boiler movements and TEXAD* flexes itself right along with boiler expansion—something that a steel plate casing that large could never do.

If you are building a large boiler, or a small one, insist on a separate enclosure quotation. You'll save plenty and you'll get a specially-made boiler enclosure engineered for your particular furnace by people who do nothing else but build furnace enclosures. Write Detroit today, or contact one of our conveniently-located offices. Be sure to ask for a copy of our 12-page tube-supported wall catalog—and a TEXAD* folder.

*T. M. REG.





One method B-L uses to fasten the enclosure to the tubes without welding into the tube. Tile-supporting castings are hung on the studs.

3133

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YOUR CITY GARBAGE COLLECTIONS

Heil 10-cu. yd. Colecto-Pak compresses 20 yds. of garbage into 10 yds.

Heil Colecto-Pak's low loading height makes it easy for your crews to handle refuse and garbage without exertion or spilling.

Cut-away view shows bucket dumping and packer plate in open position. As the bucket returns, the packer plate compresses the load.

With the bucket ready to receive another load, the packer plate is in closed position. Material is packed tightly into the rear of the body.

HERE'S the fast, easy, *better* way to assure the best possible garbage collection service for your city. The Heil Colecto-Pak is totally enclosed to eliminate ugly sights and smells. It's watertight to prevent unsanitary dripping of liquified wastes. The hydraulically operated packer plate compresses the load to eliminate waste space . . . bigger loads mean fewer trips to the dump. Finger-tip operating controls, either in the cab or at the side of the body, make loading, packing and discharge simple and easy for inexperienced labor. Quick, clean final discharge of the well-packed load is assured by the famous Heil Twin-Arm Hoist that raises the tapered, easy-to-dump body to a 45° angle in 12 seconds.

Whether you need just one or a whole fleet of garbage collection units, be sure to investigate the Heil Colecto-Pak before you buy. Write today for a complete description of time and money-saving features.

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GB-2

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CONTRACTOR'S BODY

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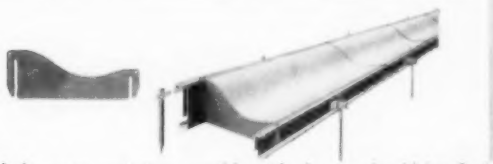
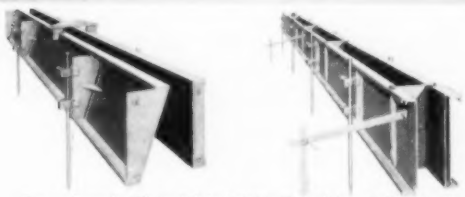
CONSTRUCTION OF CURBS and GUTTERS IS PART OF YOUR BUSINESS

Heltzel Curb and Gutter Forms (with multi-style face) permit contractors to meet **any** cross sectional requirement. And optional methods of supporting face allow contractors to meet **any** construction specifications.

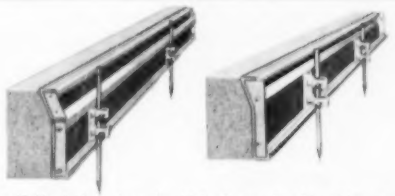
For almost 50 years Heltzel has been furnishing construction people with strong, quick-setting, fast stripping, versatile forms that make concrete forming easier, faster and less expensive.
On this page is a sampling from the world's most complete line of modern steel forms . . . designed and built by the nation's leading manufacturer of forms for concrete construction.



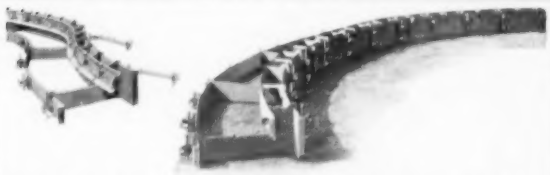
Two of the many variations possible with the popular **Helco Basic Forms.** These forms are designed to permit contractors to work **an almost** endless variety of curbing styles from the same basic set. All **Helco Basic Forms** are made of long lasting tough carbon manganese steel in 10' sections.



For curb work 12" to 24" in height, Heltzel has designed a **heavy duty dowel joint form** that has found ready acceptance in the field.



For partially battered curbs Heltzel can furnish either one or two piece front forms depending on your job requirements.



Heltzel builds a complete line of **Radius Forms**—either Rigid or Flexible. All forms are built to exact cross sectional specifications. Flexible Radius Forms are ideal for serpentine work for parks, etc.; Rigid Forms for repetitive curve pours where the radius is constant.

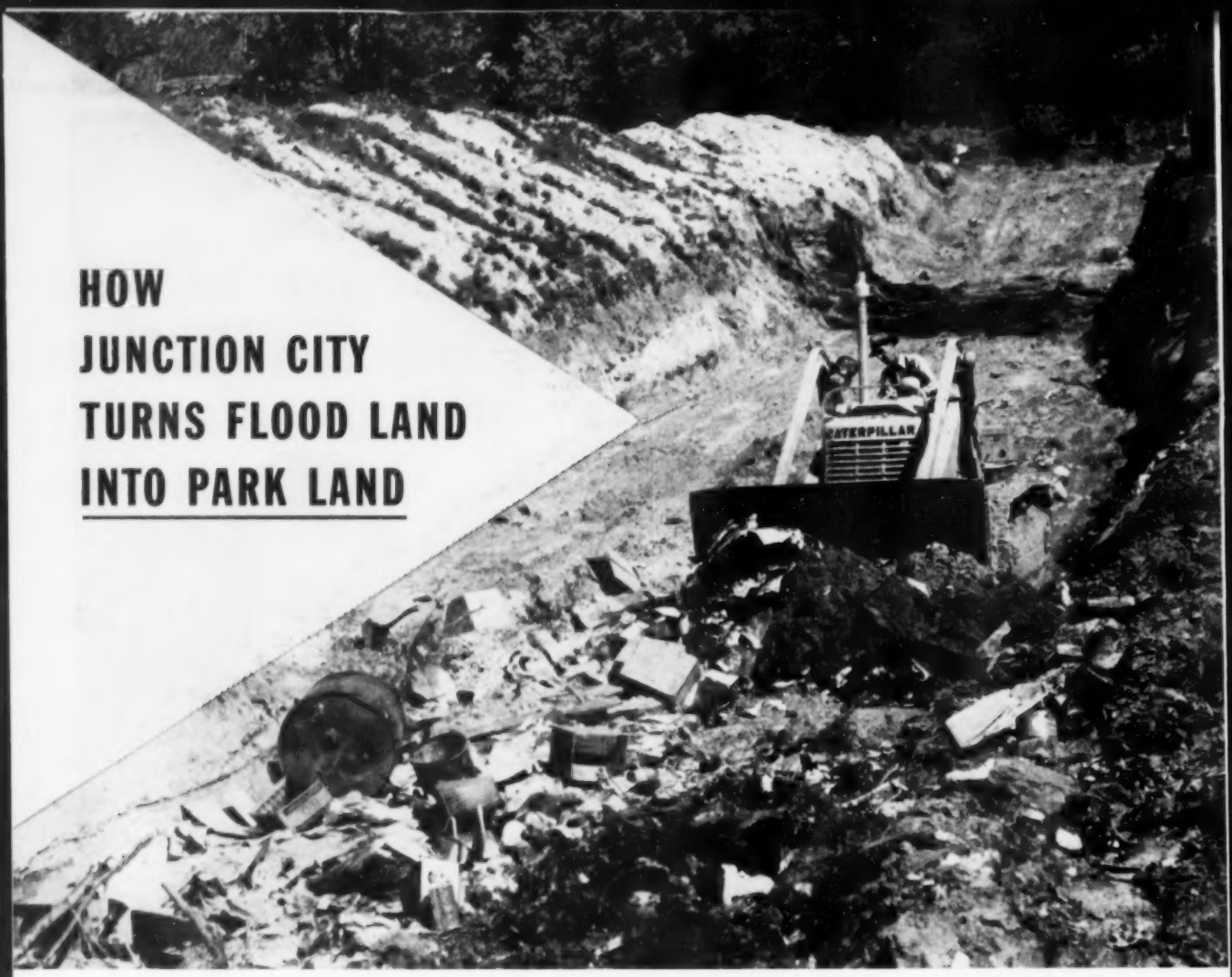
CONTRACTORS AND MUNICIPAL ENGINEERS: Today's high labor costs make the use of steel forms almost a necessity. You'll find that Heltzel can provide by far the widest variety of either standard or special forms.

If you don't already have Heltzel Form Bulletin L-20, get your copy today by writing **The Heltzel Steel Form and Iron Company, Warren, Ohio.**

—Naturally It's A— Heltzel — Flex-Plate — *Product—*

Now's the time to mail this month's Reader's Service card.

HOW JUNCTION CITY TURNS FLOOD LAND INTO PARK LAND



The powerful Cat Diesel HT4 Shovel works on sanitary landfill operations in Junction City, Kansas.

JUNCTION CITY, KANSAS, started a big project on May 18, 1953. In the northeast part of the city was a tract subject to frequent floods – at first glance, worthless acreage. But foresight, hard work and the help of Caterpillar equipment will turn this land into a beautiful park for the city.

Here's how:

Trenches were dug 3 to 6 feet deep and 10 to 20 feet wide. Day by day, city refuse is dumped into short lengths of the trench. The garbage is then spread and compacted for minimum bulk and settlement. Daily, the compacted waste is covered with a 2-foot layer of soil, and again compacted. Not only will the city gain a park, it has also found a sanitary and inexpensive solution to its garbage disposal problem.

Junction City chose Cat*-built equipment – the rugged HT4 Shovel – to convert this park. Why? City Manager V. A. Basgall sums it up this way: "In selecting the Caterpillar machine, we were influenced by the fact that we received the most horsepower, the most weight and the greatest bucket capacity per dollar over any other competitive make. Our HT4 Shovel is doing everything we expected it to do."

The HT4 Shovel makes this job a comparatively simple one. This tough machine digs, loads, carries, compacts and landscapes. It is built to give you *more* work at *lower* cost with *less* down time than any competitive make.

Call your nearby Caterpillar Dealer today for a demonstration. Let him show you how *you* can stretch your tax dollar.

Caterpillar Tractor Co., Peoria, Ill., U. S. A.

CATERPILLAR*

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Meter Overhaul Program

Increased Our Revenue

by Fourteen Percent

S. H. REAVES,

Superintendent of Water and Sewers,

Winchester, Virginia

SYSTEMATIC checking and overhauling of water meters is a sound and economical way to increase city revenue from water consumption. We proved this with a meter overhaul program instituted in our city approximately three years ago. Our records show the program has increased revenue in those areas where the project has been completed by more than 14 per cent.

Winchester, the oldest city west of the Blue Ridge, has a population of 14,000 people, and its main industry is processing and preserving fruits grown in the Shenandoah Valley. Water for the city is supplied from four springs, each an independent source, through 50 miles of water mains. Its three pumping stations have a total pumping capacity of 3.9 million gallons per day, with a 3.3 million gallon storage capacity. An additional 3 million-gallon reservoir will be completed next year. Greatest demand for water is August-January, the period when fruit canning factories are operating at full capacity. Raw water is superchlorinated and then heated with sulfur dioxide to remove excess chlorine.

Public water supply was first introduced in Winchester in 1756, when water was distributed through water mains by gravity pressure to taps at intervals along the street. Cast iron mains were first laid in 1826 and the first pumping station was installed in 1891. However, up to the mid-nineteen thirties, there were few meters in the city. A program to meter the city 100 percent was instituted during 1936-37, and currently, there are 4,200 metered services. It is interesting to note that all-city metering has postponed the necessity for additional water sources for ten to fifteen years. However, a supplementary water source has now become necessary due to the growth of industrial users. It is planned to use the north fork of the Shenandoah River 16 miles away, for that purpose.

● REPAIRMAN Hubert Rhodes working on a string of meters on the repair bench.

The Meter Check Program

The meter maintenance and overhaul program, instituted in 1950, has been scheduled to permit testing of all meters every five to seven years. While the seven-year period may be satisfactory for current conditions, there is a possibility that corrosiveness of the water from the Shenandoah River may necessitate more frequent testing.

The distribution system in the city has been divided into twelve sections, and meters are pulled section by section and brought to the Meter Repair Shop which is located in one of the pumping stations. A card record is kept by serial number for each meter. Each card lists the location of the meter, date of purchase and installation, cost of replacement parts, and date of last overhaul. On the basis of the card data gathered to date, it has been determined that the average cost of the overhaul program is $5.47 per meter, including material, labor and equipment.

Approximately 2,000 meters were checked and tested during the 1951-52 period. It was found that registration ran about 84 percent before overhaul and about 98.9 percent after overhaul—a revenue increase of 14.8 percent. Not only is our program paying for itself, but it is also substantially increasing the city's water revenue.

● METER shop is housed in the Rouss Springs Pumping Station.

COLOR

on Route Markers Aids the Motorist

Route markers in red, blue and yellow make it easier for motorists to get through cities, especially at nighttime.

JACK W. CHAMBLISS,

Asst. Traffic Control & Safety Engineer, Mississippi State Highway Department

SOME six years ago the Mississippi State Highway Department adopted a system of designating certain highway routes through towns and cities by coloring the route markers a different color for each route. This project, instigated by F. J. Russell, Maintenance Engineer, and A. M. White, Traffic Control and Safety Engineer, was created in an effort to simplify the problem of the tourist or stranger in following a specific route through a city. Similar projects had previously been tested in Texas and Louisiana. It was felt that it would be much easier and more convenient for the motorist to look for a particular color rather than for a number on a marker, and especially so in cases where several signs were required on one assembly.

At this time nine cities, including Jackson, Natchez, Tupelo, Vicksburg, Meridian, Laurel, Hattiesburg, Greenwood and Columbus have their urban routes signed or marked, following a planned color scheme.

When a motorist approaches one of these cities on any route, he sees a sign such as that shown herewith. In this assembly the route marker on the left (U.S. 49) is red, the center marker (U.S. 51) is blue, and the right hand marker (U.S. 80—business route) is a yellow. As he proceeds along his route, he locates confirmation route markers (as shown in the second photo), conforming to the color scheme as set forth above.

As the State of Mississippi was among the pioneers of the colored route marking system, it naturally gained valuable experience as to the various advantages and problems contained in such a project. It was believed that the "proof of the pudding", so to speak, would be in the attitude of the traveling public. This concern, if any, was unfounded in that once the method was adopted, it received wide acclaim on the part of the motorist and many complimentary letters were received to this effect. Many tourists wrote that they found the colored signs much easier to locate, and especially so at night, when plain white markers sometimes became lost among the many neon and electric signs and other competitive factors.

Reflectorization

A method of reflectorization that would permit the signs to retain their color over a period of years, and at the same time be of maximum legibility, was of prime importance. A third factor, that of adequate "target value" at night was also considered to be imperative to success. It has since been discovered (after experimentation) that reflectorized sheeting applied to the sign base, with cut out reflectorized figures, would meet the majority of the above requirements.

In the past, many officials have found that certain color combinations were more legible than others. Among the more legible combinations (at night) are: green background, silver figures; red background, silver figures; and blue background with silver figures—in all cases, both background and figures being reflectorized, the figures or numbers being cut from a sheet of reflectorized material. In view of this knowledge, these combinations were chosen to be used, first, on

● **SIGN assembly typical of those on all routes leading into a city. These instruct the motorist to follow a specific color for his route through town.**

the more important routes, leaving the less legible combinations to be used on minor routes.

Of course, black background (non-reflectorized) with silver cut out reflectorized letters is one of the most legible combinations known. This combination is planned to be used in future replacements of the signs placed at the entrances to a city, instructing the motorist to follow the colored system. This change is planned for both improved legibility and increased durability. In addition, this combination will be more economical in that background reflectorization will not be necessary. One fault noted in observing experimental signs made of this combination was that in using black enamel surface background, an undesirable glare was introduced under night conditions. This was corrected to some extent by tilting the sign backward and turning slightly from the road. A background material not quite as glossy as enamel would probably give better results.

Durability of Colors

For all practical purposes, the majority of the colors have proven to be durable to the extent to which they were expected. Illustrations herewith show both a day and a night view of an assembly which appears to be of good legibility in spite of several years of service. The picture at the right is somewhat misleading in that the red U.S. 49 appears to be somewhat dull—actually it had collected more of the road spray than the other two signs. Of all the signs installed, the blue consistently faded quicker and was less legible, hence it is to be avoided whenever possible. The green appears to have retained its color better than the other combinations, followed closely by the red and yellow. Recent developments and new materials of manufacturers of reflectorized sheeting may have served to eliminate, to a large extent, the deficiencies of the above mentioned colors. Modern developments in the use of bead processes also indicate a promising potential.

Limitations of System

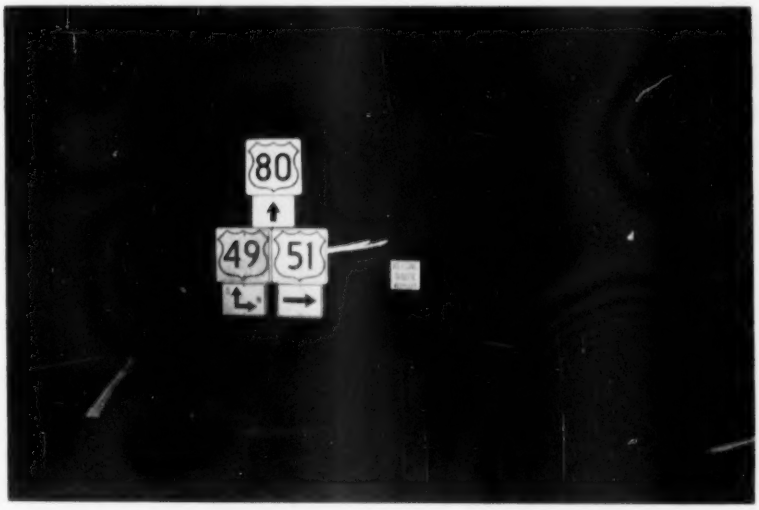
When the signs were originally installed, vandalism was high in that many signs disappeared. Once the novelty of the idea began to wear thin, this was no longer a problem and it was not necessary to replace any more signs than usual.

In spite of wide public acceptance and the many advantages of such a system, there are several limitations to be considered. One of the chief disadvantages is the limited number of colors available and acceptable for use in cases where there are more than five routes traversing a city. A second objection is that this system varies somewhat from the uniform standards, as adopted by the majority of states.

At this time, several organizations are studying the above listed disadvantages with the hope of ironing out many of the problems mentioned. The Institute of Traffic Engineers and American Association of State Highway Officials have both indicated a strong interest and have appointed committees which are currently studying the system. More extensive use of colored route markers will depend primarily upon the recommendations of these and other related organizations. The State of Mississippi is currently broadening its program to include the marking of all major towns in this manner believing it will facilitate travel.

As previously indicated, many questions remain unanswered and further research and experimentation is desired—especially so in the field of materials and methods used in introducing color into the signs. No doubt, many improvements are to be anticipated in the near future, and the motoring public will be the beneficiary in the manner of improved and simplified highway route markings.

● **DAYTIME** view of assembly: US 49 red background, white letters; US 51 blue background, white letters; and US 80 with a white background and black letters.



● **NIGHT** view of assembly above: colored route markers show up very clearly. Angle of view of slightly changed from above, so that merging traffic sign shows.

DIFFICULT TERRAIN Complicates Sewage Treatment Plant Design

GUY BROWNING ARTHUR

WITH its new sewage disposal plant in operation, Oregon City, 13 miles south of Portland, is now serving about 10,000 persons, and will soon take sewage from Gladstone, a small community adjoining on the north. The optimum will be service for a population of 25,000. At the present rate of growth in this area the plant will be large enough for a reasonable length of time.

Designing a plant of this size is something of a feat, for all the essentials must be had for the money available, and the trimmings are luxury items to be hoped for until the bids come in. There is less margin for errors, and there must be certainty of efficiency in every part. By comparison the large plant is an engineer's delight, for he can indulge his ideas with a larger sum of money, and can introduce many features which can be expected to pay off handsomely. The design of sewage plants is not frozen into a standard pattern. Old processes are being improved and new features added, but the designer of a small plant must be sure of every detail in his simpler plan.

Guided by going prices for such work the original estimate for the Oregon City plant was held down to $136,000 by Stevens & Thompson Engineers, of Portland. To their surprise the low bid, by C. M. Corkum & Company, of Portland, was only $116,000, so some of the features which had been omitted were added, bringing the final estimate to $138,504. With this amount of money a plant has been built which compares favorably with plants for many large cities.

Besides the treatment plant an intercepting sewer has been built at a cost of $185,000, and with other items the total comes to $385,560, fully covered by a bond issue of $425,000.

The intercepting sewer was dogged by serious difficulties. Originally Oregon City needed only the narrow bench between the steep hills and the Willamette River below the falls. Then it included the smaller place now called West Linn, on the west side of the river. Both depend upon the industries using power generated by the falls. Crown-Willamette Paper Company on the West Linn side makes paper for *Time* and *Life* magazines. Publishers Paper Company, in Oregon City, makes newsprint for a group of publishers. Both manufacture a miscellany of other paper products. The Oregon City Woolen Mills operate a plant founded in 1864.

Location Problems

Today the residence section has moved up on the hills, spreading over a large area in which the City Hall, the Library and considerable business have been established. Thus all the sewage flows by gravity to the treatment plant. But the only site for the plant was in a narrow space between U. S. Highway 99 and the river, about 15 ft. below the highway elevation.

Negotiations for permission to carry the intercepting sewer along the highway right-of-way dragged for some time. The 21-in. welded steel pipe now in operation is hung under a bridge, siphoned under a creek, and bolted down on piers built into the highway shoulder so that floods can't lift it. It threads a devious course through and around obstructions, and at times the difficulties threatened the whole sewerage project.

The engineers had to be reconciled to flooding of the treatment plant every year. In peak floods it may be necessary to take the motors out. In most high water periods the sewage can be given primary treatment, and when this is not possible the flow in the river will be great enough to take the sewage without treatment.

Like all other municipalities emptying sewage into the Willamette River, Oregon City undertook the project because the State issued a stop order to end the pollution of streams and restore them to conditions favorable to the salmon run. Portland's new plant is now in full operation, and the bacteria count in the river is being steadily reduced.

Average sewage flow at the Oregon City plant is now about 2,300,000 GPM, with two hours detention. It can be stepped up to 3,000,000 GPM, or even 4,000,000 GPM with proportionately shorter detention, and at that optimum it can serve a population of 25,000.

When Gladstone begins to pump its sewage to the plant it will pay Oregon City a flat annual charge of $3000, plus $15 per 1000 GPM, which will amount to about $5700 a year.

The city has benefited by excellent engineering. Not many large plants have been designed on such a thorough study of the economics of the conditions. And while the layout is simple, it is complete in all essentials for handling sewage.

Sewage enters the wet pit by gravity through a flume in which it is prechlorinated, and then flows into a Chicago comminuter. Beyond this point it is lifted 20 ft. by three vertical-lift sewage pumps to a manually - cleaned grit channel which is designed to remove this often troublesome material. Here is one of the places where a small plant must give up labor-saving features, for in a large plant this grit would be cleared from the channels by scraper-conveyors.

The vertical pumps are installed in a dry pit, and are automatically controlled by a Type M-3 Selectrol switch, which turns the pumps on and off in relays, and keeps as many in action as are necessary to handle the sewage flow.

From the grit channel the sewage passes through a Parshall flume,

down through an outfall line and into the primary clarifier, which is 60 ft. in diameter, and was furnished by Process Engineers. Floating materials are skimmed off the surface into a scum box. A notched weir of steel plate is bolted around the top of the inner shell, allowing the clear effluent to overflow to the outfall sewer.

Sludge from the sump is pumped through the heat exchanger into the digester, and is re-circulated through the heat exchanger as may be necessary to raise the temperature for best digestion.

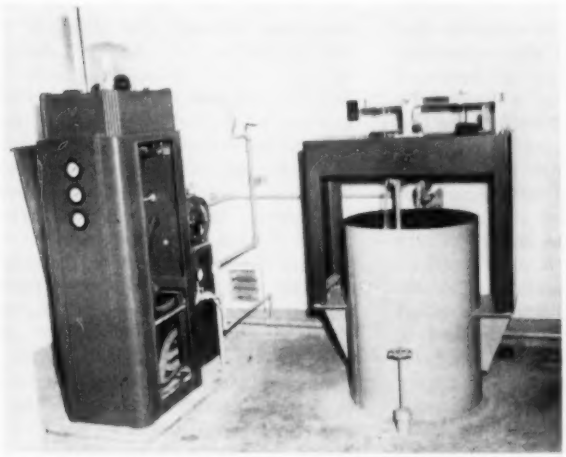
The digester is fitted with a floating cover supplied by Pacific Flush Tank Company. Digested sludge is pumped to the sludge storage tank, and can be pumped from this tank to the drying beds during summer weather. Digested sludge may be disposed of in other ways when it cannot be dried, and in periods of high water it can be pumped to the river. No analysis has been made, but it is unlikely that sludge in the amount produced by this plant can be marketed for any commercial use.

Storm water flows through the sewer lines, and in cases of any excess this water is automatically diverted from the wet pit to the river.

Good equipment has been supplied for all operations. The Wallace & Tiernan 400-lb. capacity chlorinator automatically doses the incoming sewage with the correct amount of chlorine. The three vertical-lift sewage pumps are all controlled by the Selectrol Switch in the operating room above. One is a 1-MG Fairbanks-Morse, one a 2-MG Peerless, and the third is a 3-MG Worthington. The sludge pump is by Ralph B. Carter Company; the 4-inch re-circulating pump is a Fairbanks-Morse.

During the proceedings leading up to construction Oregon City lost its manager, who had acted as city engineer. C. H. Strohmeyer, assistant city engineer, stepped into the breach and carried full responsibility. When negotiations for laying the intercepting sewer lagged he was able to have the city take over the purchase of certain equipment which would be needed, in order to have it delivered in good time. This was a substantial aid in completing the plant once the obstacles were removed. In the actual construction he acted as resident engineer for Stevens & Thompson, supervising the work.

All photos this page Barnett's Pictures



● **CHLORINATOR with 400 lbs. per day capacity automatically applies correct amount of chlorine to sewage.**

● **PRIMARY clarifier, furnished by Process Engineers, is 60 ft. in diameter and has skimmer and serrated weir.**

● **GROUND level view of the completed plant showing office at the left and the control house rear and beyond.**

● **HEAT exchanger equipment, by PFT, with sludge sampler at left.**

Smoother Riding for the New Jersey Turnpike

● Beginning of sunken section where new surface is to be placed.

● Clarkmoore heater planer being used to remove layer of old surface.

● Close view of heater planer showing effect of serrated blade.

● Loading removed material from area where new pavement will go.

THE northern end of the New Jersey Turnpike was built over some of the worst terrain to be found in any locality. The tidal flats, known as the New Jersey Meadows, are really bad—so bad in fact that there is very little building construction on them in spite of the fact they are in close proximity to the largest city in the United States. However, to serve the public, that was where the Turnpike had to go, and it did.

Very elaborate precautions were taken to construct the best possible foundation. This construction has been described in current engineering literature. Even doing the best that could be done it was realized from the first that there would be settlement to a normal degree and that this settlement would not be uniform. The expected settlement has occurred in a number of places. The settled sections are comparatively short, usually only a few hundred feet and not at all excessive in depth. Generally the vertical displacement has been from two to four inches. The flexible pavement has not been affected structurally but, has simply conformed to the differential condition as described above.

On most highways this would not be considered a serious matter and probably nothing would be done about it. However, on the Turnpike, where the daily peak traffic exceeds 80,000 vehicles traveling at about 60 miles per hour, it was decided to correct these conditions.

The solution selected was to raise the low spots generally with new bituminous concrete. To obtain a uniform riding condition and texture to match the existing pavement, it was necessary to remove some of the existing asphaltic concrete. This could be done by hand, using drills and jack-hammers, but some inconvenience to the traveling public would result, since it would be difficult to clear the area during the rush hours. Also the discarded material would be cold and could not be salvaged for use elsewhere.

To meet these objections, decision was made to use a heater-planer to remove the asphaltic concrete prior to the spreading of the new surface. A contract for performing this work was awarded to the Standard Bitulithic Company of Newark, N. J. Two Clarkmoore heater-planers have been used. These planers have an overall length of 26 feet; a 6 ft., by 6 ft., steel heating hood encloses one oil burner; and two cutting blades are arranged at an angle so that the heated material removed is windrowed centrally between the two rear wheels. The machine is self propelled and moves forward at about 12 to 18 feet per minute. Serrated blades are used so as to provide a roughened surface to increase the bond between the old pavement and the new surface. Several passes are necessary to remove the desired depth of material. The width of each cut is 6 feet.

While the temperature in the hood reaches about 1,900° F, the temperature of the removed asphaltic concrete does not exceed 350° F. The material is readily workable while hot and is hauled away to be used for patching work on shoulders and other paved areas.

One advantage of this method has been that there is no sharp drop at the edge of the section where material has been removed. Thus in the rush hours, the planer can be removed, and traffic permitted to pass over the section without hazard.

Stakes were set to mark the work to be done and the entire operation is under close supervision by engineering personnel of the Turnpike Authority. After the old material has been removed to the required depth a new bituminous concrete surface is placed in two or more layers, using mechanical spreaders, and thoroughly rolled and compacted.

By using this method, the Turnpike Authority is able to overcome deficiencies in the contour of the pavement surface and very measurably improve the riding condition with a minimum of inconvenience to the patrons of the Turnpike.

NO-MAN'S LAND

JEPTHA J. CARROLL

THE officials of Montgomery County, Maryland, are searching for an answer to an increasingly serious problem that is caused by the unfortunate propensity of water to run downhill.

Montgomery County is a "bedroom" county for its neighbor, the District of Columbia. As the federal payroll increased, the population of Montgomery County increased, growing from a semi-rural 49,206 in 1930 to an estimated 229,275 in 1953. As the population grew, countless new subdivisions sprang up. Along with the building of houses came the construction of mile after mile after mile of streets. The records show 615.17 miles of county-maintained roads in 1939 and 853.167 miles in 1953. Over 33 miles of road were built in 1952 alone!

The tremendous construction boom has taken place to a large extent at the expense of standing trees and shrubs. Major developments of several hundred acres were initiated by the clearing of every tree and shrub to permit economical mass construction. With trees and other heavy land cover removed, and with miles of newly-constructed streets providing ideal sluice-ways, the percentage of water run-off has sky-rocketed.

Unfortunately, the law permitted, and still permits, a practice which has contributed immeasureably to the problem of run-off control. Any landowner may, at any time he chooses, dedicate to "public use" any portion of his land he wishes.[1] He is thereby absolved of all responsibility for the dedicated property, including the payment of taxes on it. As might be expected, the land so dedicated is generally of no value. In fact it is less than worthless—it is a distinct liability. Except for strips of land dedicated for road purposes, dedicated parcels almost invariably consist of streambeds or marshland and immediately adjoining property. When a subdivision is developed, the run-off increases, the small country streambed is over-taxed, and flooding and erosion begin.

Developers don't feel they can afford the expense which would be involved in the control of general erosion, clearing and beautifying the course of the stream and the proper protection of the streambed at points of storm-sewer outfall. The obvious answer to the developer's problem is to get rid of the liability. No one would want to buy such property, so the developer dedicates it to public use.

The developer has tossed his "hot potato", but to whom? Before the state or the county or any other governmental agency is responsible for the newly-dedicated area, that governmental agency must perform some physical act of improvement or maintenance or must proclaim its assumption of responsibility. Without that physical act or that proclamation the dedicated area is a "no man's land".

There are literally scores of acres of streambed "no man's land" in Montgomery County. No person or organization is legally responsible for the land. Is the moral responsibility that of the state, the municipality or the developer? Whichever party assumes the function must be prepared for huge expenditures, for Mason A. Butcher, Director of Public Works of Montgomery County, estimates that the cost of meeting the problem will be in the neighborhood of $40,000,000!

Assumption of important and expensive new responsibilities by a unit of government usually take place only after the evidence is clear and unmistakable that there is substantial public demand for that assumption. The public demand for action is growing in Montgomery County, and officials of the county government are now laying plans to meet the problem if it appears that public opinion favors action by the county.

Eight Alternatives

The major alternatives for remedial action run along several lines:

1. Pay for control and mainte-

[1]There are certain restrictions on this privilege, but they relate to right-of-way width for roads, etc. There are no effective restrictions on the type of dedications referred to here.

● DAMAGED storm drain outlet. With small dry weather flow shown, heavy storms erode unprotected banks seriously.

● SMALL corner of mass-produced subdivision built at the expense of trees and shrubs. Street runoff is very heavy.

nance measures out of general tax funds;

2. Have the law changed to prohibit dedications of land to public use except when there is a guarantee of immediate acceptance of the land by a governmental unit. This, of course, would not take care of the problem of lands dedicated prior to the enactment of a change in law;

3. Create a method of sharing the expenses of control with the developer and the county or other governmental unit doing the sharing. This provision, like (2) above, could not be retroactive;

4. Create a storm drainage district with a special tax;

5. Enact a law which would provide a formula for the sharing of storm drainage and stream bed improvements by all properties within the particular drainage area to be improved. There are a number of variants of such a formula which are now in use in other cities and counties. For example, some communities call for the cost of trunk-line storm drains (or all storm sewer pipe above a minimum diameter) to be shared on an equal basis by all properties in the drainage area (area determined by survey). Other formulae call for such costs to be shared on the basis of "x" percent to be paid by the immediately abutting owners and the remainder charged to general tax funds; a fixed percentage charge based on the distance from the property in question to the site of the improvement, etc.;

6. Consolidate the handling of storm drainage problems with the handling of sanitary sewage matters. This would not necessarily be a separate and distinct approach. For instance, many communities have a special taxing area for sewer purposes, both sanitary and storm;

7. Charge all costs to the properties immediately abutting the particular improvements;

8. Last and least, the "head-in-the-sand" approach—all parties *can* legally disclaim responsibility.

Of course not all of these methods are mutually exclusive. A sound and practical plan might call for use of several different approaches and that is what is now **"jelling" in** the minds of some Montgomery County officials. The essential features of the tentative plans are first, to limit dedications of streambed property to those instances where a sufficient amount of land is dedicated to contain the stream at flood stage. This would protect private property from flood damage; second, to change the laws so as to restrict future dedication of land to public use to those instances in which a governmental unit is willing to accept immediate responsibility for its maintenance; and, third, to make use of a storm drainage district with taxing powers.

A county which has expanded at the rate Montgomery County has in the last ten years is plagued with the necessity of spending heavily on capital items: schools, roads, etc., and this means an uncomfortable tax bill for the average citizen. Before any sizeable new project is undertaken the governing body will necessarily ponder long and hard. No immediate action is contemplated. However, the problem is growing, and, as in other well-run communities, Montgomery County's plans are being laid before events force action.

● **DEDICATED property improved by the Parks and Planning Commission as a recreational area. Note bank protection. Not all property can be so protected.**

Water Waste Survey Saves Water for Corning

Philip Grannan,
Sup't. of Public Works, Corning, N. Y.
In New York State Water Works News

Officials of the City of Corning, which has a population of 17,700, authorized a waste water survey of the water distribution system in November, 1952. The survey disclosed underground leakage to the extent of 729,000 gallons per day with an additional 400,000 gallons being used and not being registered by meters. This represents 14.6% and 8%, respectively, of the total average consumption. The largest underground leak was measured at 185,000 gallons per day. It is interesting to note that these leaks were not noticed by discharge of water to the surface.

Of the leaks found, five were joint leaks with an aggregate leakage of 318,000 gpd; two were main leaks, totalling 257,000 gpd; 14 were service leaks, and these were responsible for a total of 124,000 gpd; and one was a packing gland valve leak which amounted to 30,000 gpd.

All leaks were repaired as found and resulted in a reduction of 729,000 gallons per day, or enough water in a year's time to supply the entire system for a period of sixty days. Assuming an estimated production cost of $35.00 per million gallons, this amount of leakage indicated an annual saving of $9300.

● ● ●

Toledo Has Ten Million Dollars in Equipment

A total of 850 pieces of equipment owned by the City of Toledo and used by various municipal departments represents a purchase price of $10,000,000. This equipment was repaired and maintained by the division of motor equipment and the service station in 1952, according to the annual report of L. L. Matthews, commissioner, through Service Director B. R. Mac Ritchie to City Manager Arnold Finch.

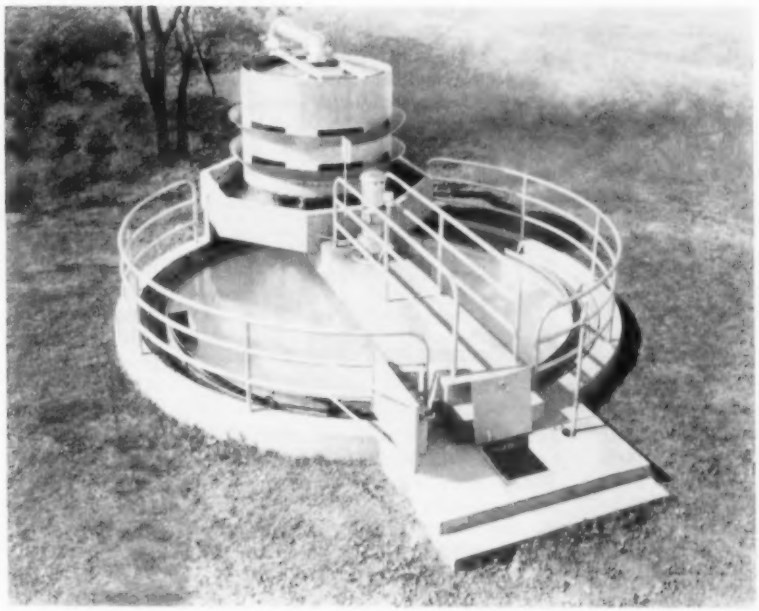
Thirty-two types of equipment, ranging from diesel tractor bulldozers to stripers for street painting are included, among them the diesel tractor stump remover bought at a cost of about $16,000 for the forestry division.

For use of the equipment in the various City departments, a total of 950,000 gallons of gasoline was provided last year. Also there were 56,000 quarts of various types of oil used; 9,000 pounds of various types of greases and 8,000 quarts of anti-freeze and alcohol.

WATER SOFTENING

for

MUNICIPALITIES AND INDUSTRIES



● WATER softening and iron removal plant.

● Coke tray is mounted above the aerator.

ESKEL NORDELL,
Administrator of Laboratories,
The Permutit Company

HARD water troubles are not a recent thing. Scale formation was undoubtedly noticed and volubly commented on when primitive man first learned to boil water. And ever since it has been an unmitigated nuisance for it forms whenever a hard water is warmed, heated, boiled or evaporated. It clogs water heaters, hot water piping, fixtures, boilers, pumps, recirculating systems, condensers, water jackets and other equipment and increases the costs for fuel, labor, repairs and replacements.

As for hard water's destructive effect on soap, that is what gave it the "hard" name it bears—it was hard to wash in it. Soap was discovered a little over 2000 years ago and its manufacture must soon have grown to be a flourishing business for the remains of a soap factory were found in the ruins of Pompeii which was destroyed by an eruption of Vesuvius in 69 A.D. So we may be sure that people have been complaining about the difficulties of doing their laundering in hard water for at least 2000 years.

As to when it was first noticed that clothes washed in hard water wore out faster than clothes washed in soft water, that also may date back a couple of thousand years. However, the earliest reference that I have yet found is in Bacon's "Natural History." As Bacon lived back in the time of Shakespeare, Ben Jonson and good queen Bess, this dates it back some four hundred and fifty years ago and what Bacon wrote was, "Chalky water is too fretting as appeareth in laundry of clothes which wear out apace."

Mark Twain once remarked, "Everybody talks about the weather but nobody seems to do anything about it." So it was with hard water; everybody talked about what a nuisance it was but century after century rolled by with nobody doing anything about it until 1841 when Clark invented the first water softening process. It is interesting that Clark included both industries and municipalities in the scope of applications for his process for his patent was granted on, "A New Mode of Rendering Certain Waters (including the Thames) Less Impure and Less Hard for the Supply and Use of Manufactories, Villages, Towns and Cities."

Cold Lime Soda Softening

Clark's process consisted of adding measured dosages of lime to the hard water, stirring, settling, and decanting with or without filtering. Since Clark used nothing but lime in his process, only the bicarbonate hardness was reduced; but Porter later introduced the use of soda ash in addition to lime for reducing both the bicarbonate and non-carbonate hardness. This Porter-Clark process, now known as the cold lime soda process, was first carried out as a batch process but later was developed into a continuous process which reduced both labor costs and space requirements.

The chemicals used are (a) lime,

(b) soda ash and/or, if silica removal is also involved, dolomitic lime or activated magnesia. In addition, a small dosage (10 to 20 ppm) of an aluminum or iron coagulant is used to floc the very finely divided precipitate into coarser particles. The lime used may be either hydrated lime or chemical lime but, if the latter, it is always slaked before use.

The cold lime soda process is used both in municipal and industrial water softening practice. The equipment used may be either of the (1) conventional; (2) sludge blanket; or (3) catalyst type. In the conventional type, the chemicals are mixed with the raw water either in a compartment in the settling tank or in a separate mixing chamber. In either case, it is next settled for 2 to 4 or more hours in a settling tank or basin after which it is filtered before use. In order to prevent after-deposits, the effluent is usually recarbonated before passing to the filters.

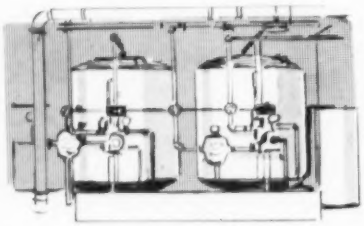
In the sludge blanket type, as typified in the Permutit (Spaulding) Precipitator, the design is such that the raw water is thoroughly mixed with and then filtered through previously formed sludge. This intimate contact with the solid phase inhibits super-saturation and therefore produces a stable effluent. Due to this, the detention period in the Precipitator need only be one hour instead of the 2 to 4 or more hours required in the older types.

The flow of the water in the Precipitator is downward through the mixing compartment where it is mixed with the required dosages of chemicals and agitated with previously formed sludge. It then filters upwardly through a suspended blanket of sludge in the sludge filter compartment. The height of this suspended sludge blanket is kept within certain limits by bleeding sludge off, through a sludge concentrator, at the same rate that new sludge is being formed.

As the water rises, the vertical velocity constantly decreases, due to the increasing cross-sectional area, until a level is reached at which the upward flow is too slow to lift the precipitates any further. Consequently they remain suspended in the up-flowing water. The effluent flows from a collecting trough at the top of the precipitator either directly to service or through filters to service.

In the catalyst type of cold lime soda softener, such as the Spiractor, the "catalyst' may be crushed and graded calcite (0.3 to 0.6 mm dia.), greensand fines, or other finely granular, insoluble substance. The Spiractor consists of a conical tank, either of closed, pressure type or open gravity type, filled about two-thirds full of catalyst. The water and chemicals enter tangentially near the bottom of the cone and spiral upwardly to the top from which the effluent passes to the filters and then to service.

During the passage of the water through the catalyst bed, the calcium carbonate, formed by the reactions, deposits on the grains of the catalyst causing them to increase in size. From time to time, the largest



granules are drawn off from the bottom of the bed, where they naturally gravitate, by means of a quick-opening valve, and dosages of new catalyst are added at the top. Roughly, the consumption of new catalyst is about 0.043 lb. per 1,000 gallons per 100 ppm of calcium hardness removed.

No coagulant is required and, within its limitations, which are the removal of calcium hardness from waters having temperatures not lower than 50°F, the Spiractor is an efficient piece of equipment because it requires a detention period of only some 8 to 12 minutes, uses no coagulant, and in place of the sludge, produces a granular by-product which can easily be disposed of or reburned.

Zeolite or Exchanger Process

As with the cold lime soda process, the zeolite or sodium cation exchange process is used both in municipal and industrial water softening practice. However, in industrial practice the water is completely softened while in municipal practice a residual hardness of 4 to 5 gpg is almost invariably left in the water. The original zeolites that were used were slow both in their softening action and their regeneration. Therefore, the hard water had to be passed slowly through the zeolite bed and the regeneration usually required 6 to 8 or more hours.

Modern cation exchangers can soften water practically as fast as it can be passed through them and the regeneration can be accomplished almost as speedily. Furthermore, efficiency has been greatly increased so that the salt consumption now is only 0.3 to 0.45 lb. per kilograin of hardness removed whereas the first commercial zeolite required 1 lb. of salt per kilograin.

For different hardnesses and types of waters, there is now a choice from a group of cation exchangers among which are (1) the natural greensand type; (2) the synthetic alumino-silicate type; (3) the carbonaceous type; and (4) the synthetic resin type. Whichever type is selected, it is employed in the form of a bed which may be from 24 to 100 inches in depth. The container which holds the cation exchanger may be either of the open gravity type or the fully enclosed steel pressure type.

In order to soften water by this process it is only necessary to flow it through a bed of the granular or bead type cation exchanger. The hardness is removed from the water by exchanging sodium cations for the calcium and magnesium cations. The softening accomplished is practically complete. When the softening capacity of the bed has been used up, the softener unit is cut out of service and the cation exchanger bed is regenerated. The regeneration consists of three steps, known as backwashing, salting and rinsing.

Backwashing is effected by passing a strong current of water upward through the softener and to waste. This loosens and regrades the bed and removes by washing up and out any dirt which may have collected in the upper part of the bed during the softening run.

Salting consists of treating the bed with a predetermined amount of a solution of common salt. When this sodium chloride solution comes in contact with the cation exchanger, it removes the accumulated lime and magnesium in the form of their very soluble chlorides and simultaneously restores the cation exchanger to its former active or sodium condition.

Rinsing, as its name implies, simply consists of rinsing the chlorides of lime and magnesium plus any excess salt out of the bed. After rinsing, the softening unit is returned to service. These cycles of softening and regeneration may be repeated indefinitely as the wear and tear on a correctly processed or

manufactured cation exchanger is very slight. Therefore, annual additions of only a very small amount of new cation exchanger are required to keep the softener functioning at its original capacity.

The softener units may be either manually operated or fully automatic. In the fully automatic type, at the end of the softening run, electrical controls cut the softener unit out of service, backwash it for a set number of minutes, introduce the correct volume of salt brine, rinse for a set period and return the unit to service. The great advantages of automatic operation are (1) that the softener unit is regenerated at whatever hour of the day or night that the softening run ends; (2) that the operator does not have to be present during the regeneration period; and (3) that all operations are carried out with machine-like accuracy and precision thus eliminating any chances of error due to the human factor.

The Combination Process

In the combination cold lime zeolite process, the water is first treated with lime in a cold lime water softener, settled, filtered, recarbonated or given a small dosage of acid and then passed through a zeolite softener. This process is used both for municipal and industrial water softening. Its principal advantages are (1) low operating costs; (2) reduction of alkalinity due to bicarbonate hardness; and (3) reduction of total dissolved solids. An additional advantage for industrial use is that it can furnish a completely softened water. In municipal practice, enough of the lime treated water is bypassed around the zeolite units to furnish a mixed effluent with a hardness of some 5 grains per gallon.

The lower operating costs depend, of course, on (1) that it is cheaper to remove bicarbonate hardness with lime treatment than with zeolite; and (2) that it is cheaper to remove non-carbonate hardness with zeolite than with soda ash treatment. Equipment costs, though, are obviously higher for a combination cold lime zeolite plant than for either a cold lime soda softener or a zeolite softener.

The preceding processes are ones which are used both for municipal and industrial water softening. There are, however, several other processes which are used only for industrial water softening. These are (1) the hot lime soda process; (2) the two stage hot lime soda phosphate process; (3) the two stage hot lime sodium cation exchanger process; (4) the hydrogen cation exchanger process; (5) distillation; and (6) the ion exchange demineralizing process.

Hot Lime Soda Process

In the hot lime soda process, the water is first heated to temperatures at or near the boiling point; it is next treated with the required dosages of hydrated lime and soda ash; then settled and finally filtered. For the removal of silica, dolomitic lime or activated magnesia may be employed.

As chemical reactions proceed much faster at higher temperatures, more complete softening may be effected with the same dosages of chemicals than in the cold process. In the hot lime soda process, a two grain per gallon excess of soda ash will yield an effluent containing a total calcium and magnesium hardness of less than 1.5 grains per gallon (26 ppm). Since the water is heated to approximately the boiling point, the hot lime soda process of water softening is limited to those applications where the water is to be used hot—principally for boiler feed water.

The equipment used in this process usually consists of the following five elements: (1) Primary heaters; (2) chemical feeders; (3) settling tank; (4) deaerating heater; and (5) filters.

In softening feedwaters for low pressure boilers, the fourth element —the deaerating heater—is often omitted.

Exhaust steam is employed to heat the raw water and where a deaerating heater is employed, all of the steam used is first passed through the deaerating heater before it passes to the primary heater. In the primary heater, the water is sprayed down through the steam in the top of the settling tank. This heating liberates the free carbon dioxide and the dissolved oxygen and nitrogen and discharges them, either through a vent or a vent condenser, to the atmosphere. The deaeration taking place in this primary heater is sufficient to lower the dissolved oxygen from saturation limits to less than 0.3 cc. per liter which is sufficient for low pressure steam boilers. By use of a deaerating heater, the oxygen may be reduced to less than 0.01 cc. per liter.

The chemicals are fed to the hot water in the top of the settling tank. They react to precipitate both the lime in the water and the added lime as calcium carbonate and the magnesium as magnesium hydroxide. These precipitates collect at the bottom of the softener forming a sludge blanket through which the treated water must rise. This sludge blanket is of especial value in the removal of silica by the use of dolomitic lime or activated magnesia.

From the drawoff the treated water then passes either directly to the filters or if complete deaeration is required, to the deaerating heater, which may be an integral part of the settling tank or a separate piece of equipment, and then to the filters. The filters are of the closed, pressure type and are filled with a non-siliceous filter medium to eliminate all danger of silica pickup by the hot alkaline effluent of the settling tank.

To avoid clogging of the filters, backwashing is performed with hot,

● **MODERN industrial demineralization and silica removal plant.**

softened and settled water from the drawoff of the settling tank and this backwash water is recovered by recirculating it back to the settling tank. The filters are usually in batteries of two or more units arranged for alternate backwashing to permit continuous operation.

Two-Stage Processes

In the two stage hot lime soda phosphate process, the effluent from the hot lime soda settling tank is treated with sodium phosphate, usually in a separate settling tank. As the solubilities of the phosphates of calcium and magnesium are very low, this treatment reduces the residual hardness of the hot lime soda effluent—about 26 ppm—down to 1 or 2 ppm.

The earlier types of zeolites were unable to handle the hot effluent from a hot lime soda water softener but the new bead type synthetic cation exchangers, such as Permutit Q, are unaffected by hot water. The latest development therefore, in hot process water softening is the two stage hot lime cation exchanger process. In this type of equipment, the hot process softener is followed by a sodium cation exchanger softener. In such an arrangement, the hot process can be used for lime treatment alone. In this case the sodium cation exchanger removes all of the non-carbonate hardness; or the hot process may use both lime and soda ash in which case, the sodium cation exchanger removes only the residual hardness. In either case, the final effluent is practically zero in hardness and therefore saves appreciable amounts of the phosphate used in the boilers.

Hydrogen Cation Exchanger

The hydrogen cation exchanger process is carried out with carbonaceous or resin type cation exchangers. This process differs from the sodium cation exchanger process as follows: hydrogen, instead of sodium, is exchanged for the cations removed from the water; the alkalinity is reduced to any desired degree; sodium, as well as calcium and magnesium, is removed from the water; and regeneration is performed with an acid instead of with salt. Otherwise, the operation of the hydrogen cation exchanger is similar to that of the sodium cation exchanger.

With the bicarbonates, the exchange forms the theoretical carbonic acid which immediately breaks down forming carbon dioxide and water. Then the carbon dioxide can be removed by aeration or degasification. Therefore, if a water contained only the bicarbonates of calcium, magnesium and sodium, the aerated effluent would be of distilled water quality. However, practically all natural waters contain some sulfates and chlorides as well as bicorbonates and these, on passing through the bed, are converted into the corresponding amounts of sulfuric acid and hydrochloric acids. These may be neutralized either by adding correctly proportioned dosages of caustic soda to the aerated effluent or by softening one portion of the water through the hydrogen cation exchanger and another portion through a sodium cation exchanger and then mixing the effluents in such proportions that the alkalinity of the latter effluent neutralizes the acidity of the former and furnishes whatever degree of alkalinity is required in the final effluent.

Ion Exchange Demineralization

As previously discussed, when a raw water is passed through a hydrogen cation exchanger, the calcium, magnesium and sodium cations are removed, hydrogen cations being given in exchange for them. The effluent therefore contains carbonic, sulfuric, hydrochloric and silicic acids in amounts equivalent to the amounts of bicarbonates, sulfates, chlorides and silica present in the raw water. Carbonic acid breaks down into carbon dioxide and water, and this carbon dioxide may be removed by aeration.

Then, by passing the aerated effluent through an anion exchanger, the acids can be removed. If a weakly basic anion exchanger is used in this step, then only the strongly ionized sulfuric and hydrochloric acids will be removed and the silica and any carbon dioxide that may be present will pass through the anion exchanger unchanged. Since carbon dioxide will pass through unchanged, the usual hookup used when a weakly basic anion exchanger is employed consists of (1) hydrogen cation exchanger unit (s); (2) weakly basic anion exchanger unit (s); and (3) degasifier. The regenerants used with such a hookup are sulfuric or hydrochloric acid for the hydrogen cation exchanger and soda ash for the weakly basic anion exchanger.

When a strongly basic anion exchanger is used, then not only the strongly ionized sulfuric and hydrochloric acids but also the weakly ionized carbonic and silicic acids are removed, thus effecting a complete demineralization. As it is much more economical to remove carbon dioxide by aeration than by an anion exchanger, the degasifier is usually placed ahead of the anion exchanger when the bicarbonate content of the water is appreciable or if the volumes of water to be handled are large. So the hookup used in such cases consists of (1) hydrogen cation exchanger unit (s); (2) degasifier; and (3) strongly basic anion exchanger unit (s).

Other arrangements may be in three steps with a degasifier in which a weakly basic anion exchanger is used to remove the strongly ionized acids and a strongly basic anion exchanger to remove the weakly ionized acids; in four steps

● **SEA water is used for regeneration in this industrial plant.**

with a degasifier arrangement in which the flow is through all of the units except during regeneration when only the slightly used last two units in the series are used while the first two heavily used units are being regenerated; in a mixed bed arrangement in which both the anion and cation exchangers are in one bed being mixed during the demineralizing run and hydraulically separated for the regeneration; and in a two-step without degasifier arrangement which may be used when the bicarbonate content of the water is low or the total amounts of water to be handled are not great.

At the end of the demineralizing run, the hydrogen cation exchanger is usually regenerated with sulfuric acid while the strongly basic anion exchanger is regenerated with caustic soda. Hydrochloric acid is also an excellent regenerant for the hydrogen cation exchanger but is more expensive than the sulfuric acid commonly used.

The costs of demineralization by ion exchange depend, of course, on the nature and amounts of mineral matter present in the raw water. Bicarbonates, for instance, are very much cheaper to remove than sulfates or chlorides providing that one of the arrangements with the degasifier is used. This is because all that is needed to remove bicarbonates is to pass the water through a hydrogen cation exchanger and then aerate it; while to remove sulfates and chlorides requires the additional step of passing it through an anion exchanger.

The demineralization costs for the great majority of natural fresh waters will range from a few cents to over 50 cents a thousand gallons. Due to these low operating costs, demineralization by ion exchange is coming into very widespread use in the industrial field.

40-Foot Cut for a Sewer Line

A. J. MAIR

IT wasn't a big contract, it wasn't big pipe, but it was deep and when Corrguated Concrete Pipe (Alberta) Limited decided to do the job by open cutting the trench there was much shaking of heads.

The contract, let by the City of Edmonton, was for twelve hundred feet of 48-inch concrete pipe and the job appeared to be straightforward with the possible exception of a long tunnel that would have to be driven under the Canadian National Railway's line. Following the regulations laid down by the Department of Transport of the Canadian Government, there would have to be four inches of concrete around the outside of the pipe in place in this tunnel.

Plans and profiles of the job showed that the grade varied from roughly thirty-eight feet below existing ground level to forty-two feet at the upper end. This apparent discrepancy is caused by a sharp rise in the ground over the twelve hundred feet, coupled with the fact that the grade had to held down to pick up the invert of a sixty inch pipe which this line was to intercept.

The contractor, considering the depth of the line and the long tunnel which would have to be driven under the tracks anyway, planned on sinking shafts and jacking the pipe. Their bid was prepared on this basis.

During the time bids were being prepared, suspected bad ground conditions were investigated by the City by means of test borings, and the results turned over to all bidders on the contract before final bids were accepted.

Further considering the various aspects of the job, with the additional light that the test borings shed on the soil profile, the jacking operation was still assumed to be the best method of attack. The bid was prepared with this method in mind, and Corrugated Concrete Pipe was subsequently awarded the contract, being low bidder.

Shortly after the contract was awarded, the contractor found that he was in a position to obtain the services of a back-hoe that would do an efficient digging job at a depth of twenty-two feet or more. For the first time open cut was considered. The soil profile was gone over again closely and the City of Edmonton was approached to see if they had any objections to open cutting the job. It was finally agreed that if the contractor was prepared to set the pipe on a concrete base and support the sides of the pipe up as far as the springline with concrete poured between the pipe and the wall of the ditch, the City was willing to let the contractor proceed on this basis.

The open nature of the portion of the city through which this line was to be built meant that dirt disposal was no problem, in fact

● **DEEPEST part of trench required two cuts and shelf on which to place material excavated by the backhoe shown above.**

all dirt excavated on the job was piled along the side of the ditch, and pushed back with a dozer during backfilling.

A TD 18 tractor and scraper was sent to the job and the stripping of the first twenty feet or so was begun. The sides of the first cut were sloped slightly to provide stability to the bank. No attempt was

(*Continued on page* 86)

PRE-CAST CONCRETE and Salvaged

REMARKABLE economy and efficiency in bridge construction by maintenance forces is being achieved by the South Carolina Highway Department through the wide use of pre-cast concrete bridges and salvaged steel spans. The pre-cast bridges are used mostly in the lower, or coastal, section of the state to cross sluggish small streams where the creosoted timber pile supports are seldom endangered by flash floods and the resulting debris. One of the chief economy advantages of the pre-cast bridges is that the entire construction job is done by maintenance forces of the department.

● **POURING the pre-cast concrete slabs for bridges. Work was done at two county maintenance shops.**

● **CRANE is placing curb sections of precast concrete bridge. Trailer at far right is loaded with slab sections. Site is in Orangeburg County.**

Salvaged steel spans come from bridges that are replaced by more modern and wider reinforced concrete structures. These spans are dismantled and reassembled mostly in the upper and hilly part of the state to replace narrow timber and timber and steel bridges, which in many cases are only single lane. The steel truss spans are necessary where timber piles cannot be used because of rock foundations or swift waters, and consequently there must be a clear channel crossing.

While salvaged spans are restricted mainly to secondary routes because of their roadway width of only 18 ft., some have been used on less traveled primary routes. In one project, spans were floated intact to the new site by barge, and plans are underway for a second similar operation. The first removal by barge was let to contract, but the second project will be carried out solely by maintenance personnel.

Spans and caps for concrete bridges are pre-cast by the Department at two maintenance shops, in Charleston County and in Orangeburg County. Both of these shops are situated in the lower part of the state where most of the pre-cast bridges are used.

C. E. WRIGHT

The foundations for the casting beds consist of two rows of seven timber piles each, which are driven into the earth. On top of the piles two 10-in. steel H beams, 36 ft. long, are placed. Across the H beams, 2 x 6s are set on 8-in. centers to support a deck slab form of ⅝-in. plywood. At the ends of this bed, which accommodates forms for a full deck span, forms are built of wood and steel for the curb and guard rail sections.

Steel channels, 10-in., made of ¼-in. stock, are placed on both sides of the deck form and braced against it by steel straps on 2-ft. centers. Midway in the 8-in. depth of the slab sections a semi-circular section of 1¼-in. dia. pipe is welded to the channels for the full length of both sides. Thus, when the concrete is poured, a groove is left. Later, during construction in the field, when the slabs of two spans are abutted, a hole is formed for a bolt to tie the slabs and spans together.

A greater strength concrete is used for the pre-cast spans than is used in most structural concrete. This consists of 7¼ sacks of cement as against 6¼ sacks. Reinforcing is

Steel Bridges Save Money

the same as for most structural concrete and the standard membrane curing compound is used in a spray that seals the water in the concrete. Reinforcement consists of ¾-in. steel rods running lengthwise on 6-in. centers and crossed with ½-in. rods on 12-in. centers. The standard pre-cast concrete slab is 14 ft. long by 5 ft. wide. For the standard bridge with a clear roadway width of 22 ft. 6 in. four slabs are joined with two curb sections.

The longest pre-cast bridge in South Carolina was recently completed over the North Fork of the Edisto River on a secondary road in Orangeburg County. It is 322 ft. long, consisting of 23 spans of 14 ft. each. One bridge, completed in 1950 on a primary route in Charleston County, had an extra 5-ft. slab in the deck to provide a finished roadway of 27 ft. 6 in.

Loading and Transporting

Methods of loading and transporting the pre-cast sections have improved since the Department began constructing them. At first the slabs for a complete span were loaded at the yard on two trucks by another truck equipped with a 35-ft. boom and a winch. Now, however, double-axle trailers have been equipped to handle a single span alone. At the Charleston yard, a gantry crane is mounted above the casting forms and carries the finished sections to the trailer.

There is no limit to the distance the pre-cast spans can be transported, but since their use has been confined chiefly to the lower part of the state, the distance from yard to site is seldom more than 75 miles. This is because the yards are centrally located in the two engineering districts in which most of these bridges are used. Little preparation is needed at the site for the erection of a pre-cast bridge. The usual procedure is to tear out the old timber bridge as the crane begins driving the treated timber piles which support the spans. A six-man crew generally can perform the whole operation of assembling a pre-cast bridge in the field.

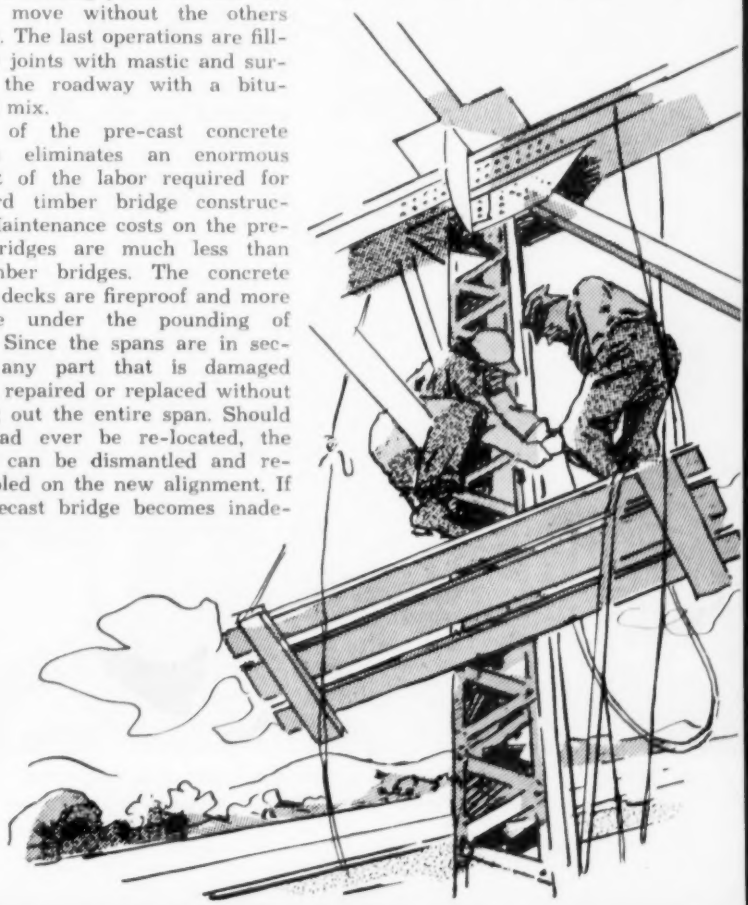
The timber piles are driven with great care as to line. Then the piles are cut off to grade, and the crane, the major piece of equipment on the job, sets the pre-cast caps and slabs in place. For some years, ½-yd. cranes were used in this operation, but recently the department purchased several combination ¾-yd. Gar Wood cranes and pile drivers, which not only speed the work but also assure greater safety in operation.

The concrete caps are secured to the timber piles by a drift pin, driven by maul through a hole in the cap into the pile. Then the slabs are put into place and locked together with the 24-ft. 6-in. bolts, 1 in. diameter. The bolts are secured with nuts and washers, tying the adjoining pre-cast sections together, four deck slabs and two curb sections to a span. In this manner the slabs are clamped together by these locking joints so that one cannot move without the others moving. The last operations are filling the joints with mastic and surfacing the roadway with a bituminous mix.

Use of the pre-cast concrete bridges eliminates an enormous amount of the labor required for standard timber bridge construction. Maintenance costs on the pre-cast bridges are much less than on timber bridges. The concrete bridge decks are fireproof and more durable under the pounding of traffic. Since the spans are in sections, any part that is damaged can be repaired or replaced without tearing out the entire span. Should the road ever be re-located, the bridge can be dismantled and re-assembled on the new alignment. If the precast bridge becomes inadequate for traffic, it can be replaced by a different type structure and used at another location to replace a timber bridge.

Salvaging Steel Bridges

The first step in dismantling a steel bridge is erecting the timber falsework to support the weight of the truss. A timber bent is placed at each panel point, the flooring being removed as necessary for the driving of piles. Great care is taken in dismantling in order to do as little damage as possible to the members. Rivet heads are either burned off with an acetylene torch or knocked off with a heavy air hammer. The members are removed in as large sections as possible to facilitate handling in transportation and reduce labor in re-erection. Trucks of the department can transport members up to 40 ft. in length. Only as many rivets as necessary



are removed in loosening the members; thus the gusset plates may remain attached to at least one section.

Sway frames are the first members removed from the span, these being lifted out by the crane as they are freed. The bituminous surfacing of the roadway is broken up by air tools and picks, and the crane lifts out the floor system, taking up the timber stringers and the steel floor beams. Each piece of the dismantled structure is match-marked, and a sketch of the existing bridge accompanies the steel to the new site to expedite re-erection.

Before beginning assembly of the steel on the new site, the maintenance forces construct at least one timber span at each end of the crossing. This eliminates the necessity of a bulkhead to the end bents or piers. Where it is possible to drive timber piles, these are used with concrete caps as the supports for the ends of the spans. However, when rock is encountered it is necessary to excavate and construct reinforced piers. In re-erection, falsework again has to be put up to support the weight of the truss while the members are being joined together. Instead of using rivets in reassembling the bridge, the department employs steel bolts of high tensile strength. This method has proved much faster and cheaper than riveting. A special torque wrench applies the maximum pull in locking the nuts and washers on the bolts.

New timber flooring with a bituminous surfacing is placed for the roadway of the re-erected bridge. The steel work is painted to complete the project.

The cost of dismantling and re-erecting a steel truss bridge is about the same per linear foot as that of constructing a new timber bridge. But timber bridges cannot meet the requirements where long spans are needed to let swift flood waters pass. Thus the saving in using salvaged steel accrues in the difference between the total cost of a new steel bridge and the cost of labor for dismantling, transporting and re-erecting the old spans.

The first steel bridge moved by barge consisted of three through truss spans. With the development of the Santee-Cooper hydroelectric project and the creation of two lakes on the Santee River, the bridge interfered with navigation on Lake Marion and also was inadequate to carry the increased vehicular traffic. It was replaced by a higher and wider concrete and structural steel bridge.

Since a bridge providing a clear channel for navigation was needed over the diversion canal between Lakes Marion and Moultrie, the bridge section of the department, under the direction of W. J. Gooding, Jr., drew plans for moving the span by barge. Also, the design of the bridge was changed for its re-erection. Two of the through trusses were converted into deck spans. To widen the bridge, a light steel grid flooring was placed on top of the span and cantilevered out. As the original floor was concrete, use of the steel grid decreased the dead weight and increased the residual strength of the bridge.

To raise the spans into place, the barge was anchored between the concrete piers. Four hand hoists then raised the span gradually into place. The lower crossbeams of the main piers supported the abutting ends of the two-deck spans. Members of the center span were loosened to permit insertion of the wider steel grid floor and re-braced at the new width.

Salvador LaTorre, now bridge construction engineer of the department, was project engineer on the diversion canal job.

The salvaged span project soon to be undertaken by maintenance forces of the department consists of shipping three spans from the North and South Santee Rivers up Black River via a part of the Intracoastal Waterway and Winyah Bay. This will be a more complicated navigation job than the diversion canal project since the Santee and Black Rivers do not connect directly and the distance the barges must travel is greater.

Two of the spans destined for Black River are 89-ft. fixed pony trusses from the South Santee and the third is a 82-ft. swing span from the North Santee. The swing span will provide an opening with a horizontal clearance of 70 ft. and when closed a 7¼-ft. clearance above mean high tide.

Construction of timber approach spans and concrete piers for the steel trusses is now underway, this work having been let to contract.

Credit is due Jesse A. Rutledge, Director of Public Relations, South Carolina Highway Department, for data on which this article is based.

● **BARGE** has floated steel bridge to new site. Span will be converted from through to deck bridge with road on top.

● **STEEL** bridge has been reassembled alongside old single lane steel truss to provide wider and safer roadway.

Water

System

FOR SMALL TOWN HAS 103 TAPS

R. Q. BOYCE,
Ripple & Howe, Consulting Engineers
Denver, Colo.

IN Byers, Colorado, as in towns and cities countrywide, the public was decidedly against spending money for construction of a much needed waterworks system. Byers is an unincorporated town approximately 45 miles due east of Denver, in the heart of the dry land wheat belt. It has a population of 360 persons dependent almost entirely upon agriculture for their livelihood. There had been almost no municipal improvements in the 40 years of the town's young life. Each householder was forced to install a private water system or to haul water from a deep well at the schoolhouse. Although the community had a well-equipped volunteer fire department, fire protection was almost non-existent due to the acute shortage of water.

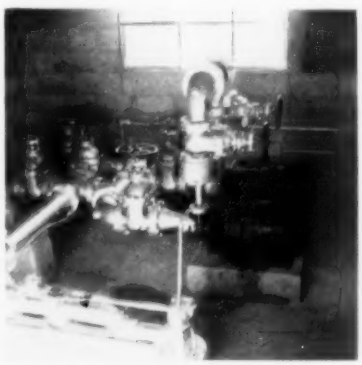
The first step in the right direction was taken by a group of interested citizens in 1947. This group secured the services of Ripple and Howe, Consulting Engineers of Denver to prepare a town plan and preliminary report. Upon receipt of this report, the committee decided that public interest was not sufficient at that time to warrant further investigation.

In 1952 the project was revived and late in the year a Water and Sanitation District, which is a quasi-municipal corporation, was formed to go ahead with the project. In early 1953 a bond issue was voted for $60,000. Ripple and Howe were then authorized to proceed with construction plans.

In April a contract was awarded to the Robert C. Warner Company of Denver for Transite water lines, another to the Holden and Holden Company of Hudson, Colorado for the deep well; and a third to Choun Construction Company of Denver for the pump hose, reservoir and appurtenaces. Construction was begun immediately and the entire project was finished in July, 1953.

The distribution system contains 9500 ft. of 4-inch main and 1600 ft. of 6-inch. The funds available prohibited the construction of an elevated storage tank and the topography is such that the highest point is only about 40 feet above the lowest point in the area served. The only possibility of providing the pressure was to install a pressure tank in which air under pressure provides water under pressure in the mains or to use a pressure control on the pumps to introduce direct pressure into the lines.

The low normal flows in the system balanced against possible fire demand indicated that pumping directly into the mains would be inadvisable and the hydro-pneumatic system was chosen.



● **INSIDE pump house. Above: Storage and pressure tanks.**

The Engineers estimated that approximately 70 of the possible 106 equivalent taps would be connected during the first year of operation. The Board of Directors felt that the system would pay for itself much more rapidly if all possible users were served so it was decided to borrow enough additional funds to provide service (including meter, meter pit and installation) at the property line at no cost to the consumer. Because of this plan 103 equivalent taps were actually connected while the pipeline contractor was under contract to do that work.

The system as constructed, includes a deep well (710 feet) of 6⅝ and 4⅝-inch casing, equipped with a Reda submersible pump to the Fox Hill formation with storage provided in the form of a 50,000 gallon steel storage tank. There were installed approximately two miles of Transite pipe in 4-in. and 6-in. sizes with 11 Pacific States hydrants and 27 Pacific States gate valves. A concrete block pump house 12′ x 16′ was constructed to enclose the well, booster pumps, and control system.

The booster pumps draw water from the 50,000 gal. storage reservoir and discharge into a hydro-pneumatic tank 8 ft. in diameter and 24 ft. long; also the pumps are valved so they may pump directly into the distribution lines.

Within three months after operation had begun, the first interest payment on the bonds was made out of revenue and the system is presently operating in the black with a decrease in water charges already in view.

DUAL-FUEL Engine Cuts Costs by 55.5%

● MUNICIPAL power plant houses five engines, two powered by natural gas.

ENOS PURCELL, Superintendent, Herington, Kansas Municipal Water and Electric Dept.

BY switching from diesel to predominantly dual-fuel operation, the municipal power plant at Herington, Kansas, is currently supplying electricity at an average fuel and lube cost of only 3.47 mills per kwh., less than half the former cost of 7.8 mills in 1950, the last year of full diesel operation. In 1952, 6,063,500 kwh. were produced, with a consumption of 81,922 gals. of fuel oil, 61,255 MCF of natural gas and 3,505 gals. of lube oil. In 1950, with a production of 4,799,800 kwh. 410,214 gals. of oil and 5,240 gals. of lube were used.

Perhaps the saving in dollars and cents may be better understood by comparing actual yearly fuel bills. In 1952, the plant generated 1,263,600 more kwh. than in 1950, due to its expanded facilities. However, at the end of this record year the total fuel and lube bill amounted to $16,367.52 less than it did in 1950, a drop of 43.7 percent, despite the increased output.

In 1951, the plant transferred a total of $27,830 to the city, and in 1952 it followed this with approximately $30,000. As a result, at the end of only three years the city will find it possible to call in a 10-year bond issue of $80,000 which it used to help finance the modernization and expansion program.

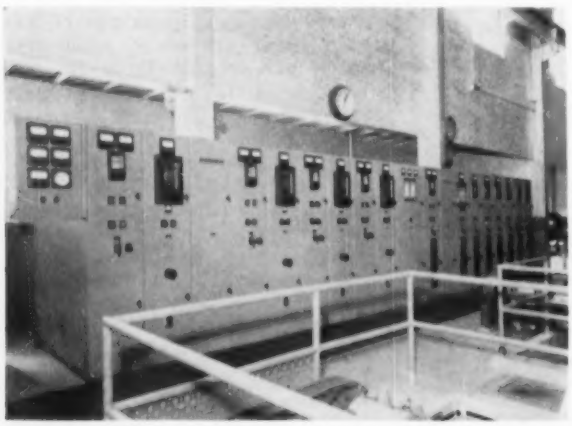
The Fairbanks-Morse opposed-piston engine, which is making most of these savings possible, is a 10-cylinder unit, rated at 1,600 hp at 720 rpm. It drives directly an F-M alternator with direct-connected exciter. In its first full calendar year of dual-fuel operation (1952), this engine ran almost continuously, being in service more than 86 percent of the time, and generated 5,089,900 kwh. of electricity. At the delivered price paid for oil and gas, the consumption of 53,661 MCF of natural gas and 56,687 gallons of fuel oil represents an average fuel cost of only 3.35 mills per kwh.

This engine automatically switches over to full oil operation should the normal gas pressure fail, while if the normal pressure in the pilot oil system should fail, the unit shuts down automatically to prevent gas from collecting in the system.

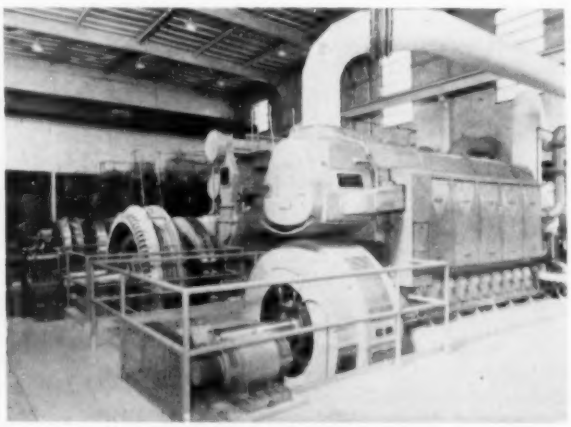
The same safety devices are built into the plant's second dual-fuel engine, a converted Fairbanks-Morse, which develops a rated 1,200 hp at 300 rpm and operates at an average fuel cost of 3.38 mills per kwh. Together these two units handled 95.5 percent of the plant's total production in 1952.

There are also three small oil engines, all F-M. Two of them, which develop their rated horsepower at 257 rpm, have been giving excellent service since installation in 1927 and 1928; in 1935 they were modernized and their horsepower raised from 560 to 600 hp. That same year saw the purchase of the plant's third diesel engine, which develops its rated 600 hp at 257 rpm. This unit replaced the last of the semi-diesels then in use.

Natural gas with a heating value of 900 btu per cubic foot is purchased at an average cost of $0.202 per MCF. Delivered prices are $0.25 for the first 200 MCF, $0.22 for the next 100 MCF and $0.20 for any amount over 300 MCF. The gas reaches the plant at 80 psi, passing through a regulator and orifice meter. Before going to the engines it is further reduced to 30 psi. Fuel oil, of 30-32 gravity, is purchased at $0.085 per gallon and is delivered in tank car lots. It is stored above ground in two steel storage tanks with individual capacities of 35,000 gallons.



● SWITCHBOARD by Westinghouse controls plant operation.



● DUAL-FUEL 1600-hp F-M engine is shown in foreground.

AIRDROME IS WATER SUPPLY RESERVOIR

M. D. MORRIS, A.M., ASCE

OPERATING land-based aircraft off the local reservoir was the ingenious solution to a double-barreled problem confronting Virgin Islands engineers. They built Bourne Field between 1948 and 1950 against all sorts of obstacles, then stored the island's water supply in the porous subsoil to support St. Thomas' only airstrip. Until now security restrictions have kept from the profession the account of how engineers have again changed the nature of things in order to benefit the populace.

Of all the Virgin Islands, only St. Croix has natural ground-water. On the rest, including St. Thomas, the countryside seems patchworked with tile or concrete catchment areas. This idea rained upon the Danes 50 to 75 years ago. On an island-wide basis, each square foot of catchment area yields close to eight gallons of storage per annum. However, sidehill slopes do not show a full square foot yield, and the water demand of the St. Thomas population, including service personnel, was about to exceed the supply. The Department of Defense believed that some potential enemy could determine the size of the garrison on the island from the combined size of catchment areas that showed on aerial photographs: there would have to be some other way to get water.

Beyond collectment of a sufficient supply, there was the matter of storage. The soil at any possible location for an artificial lake was too porous. Surface tanks were a security risk, and large underground tanks far too expensive.

At the same time the question of an airfield arose. Larger planes and increased traffic called for something the subsurface and the physical layout of the island prohibited.

Here at once appeared the single solution to both problems. With a bit of imagination an airstrip could be built at Lindbergh Bay, and easily camouflaged. It was also a natural as a level catchment area. The runoff would be processed, then stored in the subsoil of the airstrip by floating it on the seawater table, thereby assuring no differential settlement of the runway. This plan met with the approval of the Defense Department; the Interior Department; and the Civil Aeronautics Authority. Thomas G. Mooney, the District Engineer, and C. L. McGuiness, Senior Geologist for the Office of Territories, Department of Interior; Walter Rich, District Engineer for the C.A.A.; and others were assisted by R. L. Kenan & Associates of Montgomery, Alabama, consultants. They conceived and built a combined airstrip and catchment area 4200 feet long and 200 feet wide, running from the hills at its eastern end to the bay on the west. For drainage, a cross slope of 1 on 100 was held constant with the south side two feet higher. They built 21 hopper collection bays on the lower north side, all 40 feet wide and of 200-foot lengths to coincide with a CAA requirement of 200-foot intervals for field light locations.

The bays drain by gravity through 10-inch to 36-inch diameter concrete pipe, into a two-compartment, underground 1.5-million gallon storage tank. From there, the runoff goes through a conventional sand filter, and then a chlorinator. Next the water is pumped into a gallery well 2700 feet long, and three feet wide, which recharges the ground under the airstrip.

Along the gallery well there are periodic manholes for cleanout and inspection; and flap valves for emergency cutoff. From the observation wells along the south side the amount of water in the subsurface charge can be inspected and controlled.

● **TERRAIN at the western end of the field, with the old quarry in foreground.**

The tide averages only 8 inches and the normal location of the seawater table is —6 feet. This is forced down to —40 feet by the weight of the overlying fresh water charge. Between —40 and —80 feet there is a "twilight zone" of semi-salt water having a count of +1200 chlorides. Below —80 feet is seawater with a 16,000 chloride count. The upper limit of fresh water storage is —2.5 feet under the bottom of the runway base.

All other hillside catchment areas in St. Thomas are tied into this system. Bourne Field alone yields runoff from close to a million square feet of collection area. The average annual rainfall is 44 inches, the an-

nual gain only 38. There is a 6-inch fog repression for evaporation on the flat surface.

On top of the natural soil the subgrade was stabilized. On top of an 18-inch base course, two 5-inch layers of dry-bound macadam rolled to 4 inches each were placed. This was topped with a tack coat, and a 2-inch wearing course of plant mixed Bitumuls.

At present the daily plane traffic does not impose sufficient use on the runway. It is beginning to crack and allow water into the —2.5 foot dry zone as well as into the subgrade without going through the treatment system. To correct this, some rubber-tired rolling is being done.

Bourne Field, named for a U. S. Marine fighter pilot killed in action in the Pacific, has its limitations; the prevailing wind is always from the east. Although it is fine to come in over the bay for a landing, the size and weight of aircraft that can take off from a 4200-foot runway and get over the hills at the east end is limited. Nonetheless, this combined airstrip and catchment-storage area stands as a living monument to the ingenuity of the engineering mind.

● **POROUS SUBSOIL beneath runways of Bourne Field serves as reservoir to store runoff water collected from the airstrip and other catchment areas on the island.**

40-Foot Deep Sewer Cut

(*Continued from page 79*)

made to shore this cut, and although at times it was open for three weeks at a time, no serious slips occurred.

When the first cut was down to the depth from which the back-hoe could excavate to grade, the machine was walked down onto its bench and work was started on the final cut. It was found that at the shallower end of the job the machine could empty the bucket on the ground surface, and another dozer was put to work keeping the excavated material cleared back from the edge of the open cut. This dozer had ample time to stock pile the excavated earth and later on to do the back-filling.

As the cut became deeper it was necessary to step the wall again so that the back-hoe bucket could be emptied. Another dozer was put on the job to keep the material pushed from this shelf up onto ground level and to stock pile it there. The original dozer was sent back to look after the back filling and general clean-up.

The soil profile proved to be fairly accurate. Extremely difficult ground conditions were encountered in the first four-hundred feet of the job. Running sand and water were hit close to grade, and serious cave-ins resulted.

To provide protection for the crews working at the bottom of the ditch, a steel shelter was fabricated by the contractor. It consisted of two walls and a roof framed from 4-inch I beams, and sheathed with light steel plate. The shelter was open at both ends and the bottom, allowing workmen to prepare grade for the pipe while protected from cave-ins from the sides and above. The shelter was dragged along the bottom of the ditch and kept just far enough ahead of the completed line to allow another pipe to be dropped between the shelter and the last pipe in place. At one time a cave-in piled dirt five feet over the top of the hut, but the two men working beneath it were quite safe.

As the job neared completion and the cut became deeper, a second shelf was necessary to allow the back-hoe to dump. A lip about a foot and a half high was left along the edge of this shelf to stop lumps from rolling back down into the cut. The shelf was kept clear by a dozer as mentioned previously.

Ground conditions gradually improved, and although small slips and pockets of sand were encountered, no serious difficulty impeded progress for the rest of the job.

The contractor averaged about sixty feet per day over the whole job for a ten-hour day. Work on the tunnel under the railroad track is under way, using jacks, and no serious difficulty has arisen.

Stripping to allow the back-hoe to dig to grade is common practice on sewer jobs in this locality. A gravity system covering a large area must, of necessity, require deep cuts in some areas. The usual limit up to this time has been in the twelve to fifteen-foot range. By taking off the first twenty or more feet with a scraper, this contractor was able to do the work quickly, efficiently and economically with equipment he had readily at hand, and was able to turn the job over to the City of Edmonton on schedule. A combination of a little good luck and a lot of good management has provided a satisfactory job for all concerned.

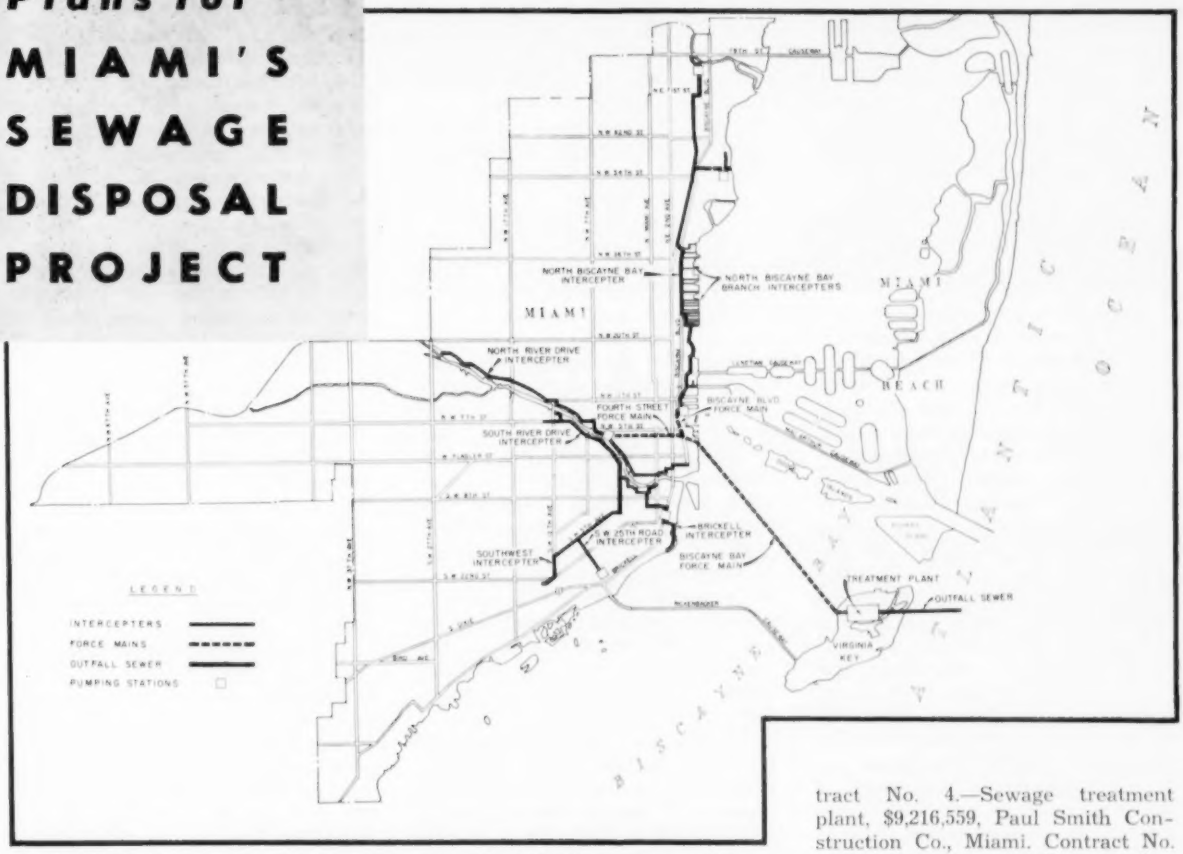
• • •

Fellowship in Engineering or Sanitation

In commemoration of the 50th anniversary of the invention of the Dorr Classifier by Dr. John Van Nostrand Dorr, a fellowship has been established which is open to citizens of the US or Canada who hold a BS or MS degree, with training in chemistry, biochemistry, biology, bacteriology or civil, sanitary or chemical engineering.

The stipend is $1800 per year, beginning Sept. 1, 1954, plus tuition. Apply before April 1 to Dr. Harold E. Orford, Department of Sanitation, Rutgers University, New Brunswick, New Jersey.

Plans for MIAMI'S SEWAGE DISPOSAL PROJECT



● **GENERAL PLAN of the main interceptor sewers for Miami's sewerage project.**

C. E. WRIGHT

Initial work is under way by the City of Miami, Fla., on a $27,000,000 sewage disposal system which will take three and a half years to complete. Many more years have been required to bring the project to the contract stage. There were no sewers at all in Miami until 1906. By 1922 seventy miles had been laid, followed by an extensive program from 1927 through 1931. In 1949 the Florida State Board of Health and the City of Miami made a joint survey of the Miami River and Biscayne Bay to determine the effects of dumping sewage into the water. The findings brought a public demand for a modern system of disposal, but it took many years before work could be started.

Miami voters approved the project and the issuance of bonds last year, but action was held up pending the outcome of another vote taken on the question of a Dade County consolidation project. When this was defeated, Miami resumed steps to carry out its original plan, which was to be financed by issuance of $16,100,000 in general obligation bonds and $11,100,000 in revenue bonds, the latter to be retired by a sewer service charge on all properties using the system. The bonds were sold at 3.70 percent by private negotiation, but the sale was halted by a taxpayer's suit and the court upheld the plaintiff's contention that the bonds should have been offered for public bidding. On open bids the best offer was at 4.32 percent. Consummation of this sale was also held up by a taxpayer's suit, which, however, was thrown out of court. With the last obstacle out of the way, contracts were awarded on bids which aggregated approximately the same as the engineers' estimates. Six contracts were awarded as of August 17, 1953, as follows:

Contract No. 1.—Intercepting sewers and force mains, $6,719,847.90, to Blythe Brothers, Charlotte, N. C., and W. T. Price Dredging Co., Miami. Contract No. 2.—Sewage pumping stations, $2,454,160, DeFonce Construction Co., Bridgeport, Conn. Contract No. 3—Biscayne Bay force main, $1,988,878, Merritt-Chapman & Scott Corp., New York. Contract No. 4.—Sewage treatment plant, $9,216,559, Paul Smith Construction Co., Miami. Contract No. 5.—Virginia Key outfall sewer, $1,677,461.38, Diamond Construction Co., Savannah, Ga. Contract No. 6—Virginia Key access road, $209,938.70, Troup Brothers, Inc., Miami.

On contracts 1, 2 and 3 the engineering and design work was done by Maurice H. Connell & Associates and Radar Engineering Co., both of Miami. Metcalf & Eddy, Boston, did the engineering on contracts 4 and 5. Contract No. 6 was handled by the City of Miami Engineering Department, Arthur E. Darlow, director. These engineers will also supervise construction. The entire project is under the supervision of the Department of Water and Sewers of Miami, W. A. Glass, director.

Only the most congested area of Miami is now sewered, comprising about a third of the geographical area and half the population. It is estimated that it will cost about $40,000,000 to provide sewers for the remainder of the city, much of which is now served by septic tanks.

In the planning of the Miami system, pre-sedimentation has been omitted, largely because experience at Milwaukee and elsewhere had convinced the engineers that it probably would not be necessary for efficient operation. However,

space has been left for pre-sedimentation tanks in the design and they may later be installed if there is too much load on the aeration system. There is little industrial waste in Miami, sewage being largely domestic and diluted by ground water. Another factor left for later decision is whether fertilizer shall be made from the sludge. This can be done at some time in the future if found desirable.

There are seventy-two sewer outlets at present, mostly adjacent to downtown Miami. There are twenty-two pumping stations to lift sewage from low areas and discharge into sewers leading to these outlets. A new system of intercepting sewers has been designed for the entire city, but only sewers needed to intercept the flow from the seventy-two outlets will be built now. The long-range plan is to extend this system when unserved areas are provided with lateral sewers. The interceptors will be laid with inverts at four to twenty-two feet below ground surface. Most of the underlying formation of Miami is oolite, which is soft enough to be cut easily by ditching machines. All pipe thirty-inch and larger used in this work will be reinforced concrete, to be precast by the Universal Concrete Pipe Co. at Dania, Fla. Smaller diameters will be clay pipe. One of the great difficulties in designing the intercepting system was to find space under city streets because of underground structures.

Six new pumping stations will be built. The two largest will be 50,000 and 60,000 gpm capacity, each equipped with five pumps. Of the four others, three of 800, 1400 and 2680 gpm will have two pumps and one of 3180 gpm will be served by three pumps. At the 50,000 gpm station the sewage flow at maximum will be 41.42 mgd, while at the 60,000 gpm station the maximum will be 54.21 mgd. Fairbanks, Morse & Co. pumps will be used for all of these stations.

Sewage will enter the two large pumping stations through mechanically cleaned bar screens with screening shredders and will then flow into duplicate suction wells, one of which may be shut off if desired. Cone check valves on the pump discharge ports will prevent water hammer when the pump is stopped. Venturi meters will measure the flow. Both main pumping stations will have chlorinating equipment to reduce septicity as the sewage flows across the bay to the treatment plant on Virginia Key. Four of the five pumps serving these large stations will have wound rotor motors to permit variation in pump speeds to avoid sudden changes in flow to the treatment plant. Speed control will be actuated by floats in the suction wells, increasing the discharge rate as the sewage level rises.

All of the pumping stations will be operated by purchased electric power. The two larger stations will be provided with auxiliary diesel engines to be used in case of power failure, but the smaller ones will have no auxiliary power. In case of power failure, the sewage will overflow into the nearest body of water. The four small stations are to be operated on the fill and draw principle with constant speed electric motors. All pumps will be vertical shaft centrifugal type to be placed in a dry well adjacent to a wet well. No superstructures will be built for the three smallest pumping stations as they will project only a few feet above ground. One of the small stations will have a small superstructure.

The Biscayne Bay force main will be 72-in. dia. and 16,950 feet long, designed for a minimum rate of discharge of 11 mgd in 1955 and a maximum of 152 by 1980, when the population of Miami will be 533,000, according to present estimates, or more than double the present number. It will be laid with the invert 15 to 28 ft. below mean water level and will be covered with 5 ft. of protective material. There will be pressure-type manholes at intervals of 1600 ft. along the bay crossing so that the main can be entered by divers if it should ever become necessary. All other force mains will be 42 to 60-in. dia. with rubber and steel joints and will discharge to the bay crossing.

Initial capacity of the sewage disposal plant on Virginia Key will be 47 mgd, but provision will be made for expansion. Sewage will flow through the plant by gravity, but there will also be provision for pumping stations should they later be needed to increase capacity. In this high rate activated sludge process, the sewage will first flow into two aerated grit channels, each 13x 23x64 ft. In these the grit will be collected and washed by scraper conveyors and then discharged by an ejector to the grit disposal area adjacent. It will then pass through two Parshall flumes into aeration tanks of the spiral-flow type, using three passes. These tanks are to be equipped with removable diffuser headers. The activated sludge will be mixed with sewage as it enters the aeration tanks, the combined flow to be aerated for two and three quarter hours. After a detention period of two and a half hours in the final settling tanks, the sludge will be removed by scraper collectors to sumps and pumped to the influent end of the aeration tanks. The portion not required as return sludge will be chlorinated and discharged into concentration tanks, then to digestion tanks. Digested sludge will be pumped to elutriation tanks, where it will be washed with plant effluent, conditioned by an iron salt, dewatered on vacuum filters, dried by a flash drying process and then incinerated. The ash will be flushed into lagoons for final disposal.

The outfall pipe will be 108-in. dia. for 1850 ft. on land and 90-in. pipe under water, with multiple outlets in 18 ft. of water 4590 ft. offshore.

Gas from the digestion tanks will be stored under pressure and used to run the engines in the blower house for supplying compressed air to the aeration tanks. The blower house will be equipped with five engines, four for the air compressors and one for a standby electric generator. Two of the compressors, to be driven by spark-ignition engines, will use sludge gas only and two will use sludge gas or diesel fuel or mixture of the two as occasion necessitates.

In the design of this plant the engineers have provided for expected growth of Miami for 25 years beyond the completion date, including the ultimate servicing of the city not now served by lateral sewers. These dimensions indicate the potential capacity of the various components: Two aerated grit channels, each 13x23x64 ft.; two Parshall flumes, each 31 ft. 6 in. x 5 ft. throat; four aeration tanks, each 13x69x210 ft.; four final settling tanks, each 11x57x275 ft.; four chlorinators, one with 400 lbs. and three with 6000 lbs. a day capacity each; two sludge concentration tanks, each 13x55 ft. dia.; four sludge digestion tanks, each 105 ft. dia. x 29 ft.; one gas storage tank, 32-ft. dia. sphere; two sludge elutriation tanks, 55 ft. dia. x 13 ft.; four sludge dewatering vacuum filters, 8 ft. dia. x 12 ft. long; two furnaces for sludge drying and incineration; two sludge lagoons, 9x200x359 ft.

At the time of this writing final decisions had not been reached on makes of all of the equipment to be used.

EVALUATING
The Use of Sewage Lagoons

ROBERT J. ELLISON and

R. L. SMITH

Sanitary Engineers

IN many communities, the cost of the customary sewage treatment plant has been viewed as prohibitive and some cities have been considering the use of lagoons or shallow sewage ponds as a low cost solution to the problem. Lagoons have had extensive use for the treatment of industrial wastes for many years. The methods of construction, design and operation are reasonably well stabilized and the results to be obtained by this treatment can be anticipated. However, the lagoon method of treatment is only a part of the sewage disposal picture—the correct evaluation of the use of this method is the important consideration.

The official publication of the North Dakota Water & Sewage Conference for October, 1952, includes an article by W. Van Heuvelen of the Department of Health that is extremely favorable to the lagoon method of treatment. This article proposes the treatment of raw sewage in an open lagoon and cites the record of seven operating lagoons in North Dakota. The following are quotations from this article:—"The sewage is carried out of the city limits and disposed of in such manner that nuisance conditions do not develop. It also disposes of the sewage so that it does not pollute surface or underground waters *nor create a health hazard* or nuisance condition. . . After the lagoon has been in operation a few years, the surrounding dikes become covered with vegetation and the water in the lagoon becomes rich in plant and animal life of all types—one observer has noted that a sewage lagoon becomes a very fine wild-life habitat." At the Maddock plant, the warm weather removal of organic material was 95%, in the winter months, the removal was 65%. This is good treatment. Further, it is stated: "During the winter months, the lagoon is ice covered, except a small area around the inlet which stays open during even the coldest winter months." The article recommends a storage period of about 120 days, with location of the lagoon at least one-half mile from any homes.

It is apparently proposed, in some cases, to construct these raw sewage lagoons on the basis of disposing of the liquid entirely by evaporation, maintaining the bottom completely sealed. In the case of lagoons in the southern half of Minnesota, the normal rainfall just about equals the evaporation over the yearly period with one exceeding the other at various times of the year. This would imply that liquid flow must leave the lagoon in an amount equal to the volume of the raw sewage. Clay is generally accepted as the most impervious of the soils, but it is not impervious to water unless it is puddled or wet worked and we question if that is proposed. Normal ground water flow through compacted clay approximates six inches per day. In the case of crevices in the sub-soil, the percolation rate may be very high. In the case of a relatively high population density, under-ground seepage of sewage may become a menace to public health.

Lagoons have been used in the southwest for many years. It is customary in that part of the country to provide settling and chlorination for the sewage prior to discharge into the lagoon. Most states have generally required a relatively high degree of treatment before lagooning. To our knowledge, North Dakota is the only state permitting the treatment of raw sewage in a lagoon.

Sewage treatment consists in large part in the stabilization of the organic material present in the sewage. Domestic sewage contains many micro-organisms that cause serious diseases in man. The control of disease is perhaps the most important reason for sewage treatment. The basic theory of sound treatment would be to place the raw sewage in a sealed container and keep it there until all danger of infection is past. There appears to be little difference between raw sewage placed on the open prairie and not permitted to flow into a stream; and the placement of that raw sewage in an open sewage pond. There will be less odor from the lagoon but the raw sewage will be exposed to the atmosphere with the same contacts with humans, insects, animals and wild-fowl.

Effect on Wildlife

Raw sewage is warm and the picture of the small open spot in the otherwise ice-covered surface of the lagoon is an important consideration. This point will quickly become the source of food and drinking water for wild life. Will hunting be barred in the general vicinity of the lagoon? Is not this small open area a potential source of infection of all that part of the country? During the summer months, the same potential infection will be present but the entire lagoon surface will be exposed. The psychic approach

(*Continued on page* 142)

Mechanical Soil Stabilization

Courtesy Calcium Chloride Institute.

● **GRAVEL ROAD has been mechanically stabilized and surface application of calcium chloride is being spread.**

LEO J. RITTER, JR.

SOIL stabilization may be defined as a method of processing soil to produce a stable material capable of carrying traffic loads under all weather conditions. While the ability of such soil structures to carry loads is limited—soil stabilization is adapted primarily to light-traffic highways—stabilization can, nevertheless, be a potent factor in meeting increased highway costs and the ever-increasing demand for more roads.

Mechanical soil stabilization is accomplished by blending the existing subgrade soil with other suitable soil to provide stability through internal friction, interlocking of particles and cohesion. Such construction can be used for bases, or to support relatively thin bituminous wearing surfaces. In Iowa, surfaces of this type have been used successfully on farm-to-market roads which carry up to 250 vehicles per day (4). Stabilized mixtures lend themselves also to stage construction, in which they first function as surfaces; as traffic increases a bituminous wearing surface is applied. They are occasionally used for the direct support of high-type pavements.

There are three essentials for successful mechanical stabilization. These are proper gradation, a satisfactory binder soil and proper compaction, which implies proper control of the moisture content. Uniform blending of all materials is essential in order to insure uniform supporting power throughout the project.

In this work the portion of the material which is retained on a No. 200 sieve is generally termed "aggregate". Its principal function is to contribute internal friction. Additional shearing resistance may be supplied by interlocking of the aggregate particles, if there are enough present. Nearly any material of a granular nature which does not soften when wet, or break down under traffic, can be used. However, the best aggregates are those which are composed of hard, angular, durable particles. The gradation of this part of the mixture is important, since the most desirable aggregates are those which are well graded from coarse to fine. Well-graded materials are preferred because they can be more readily compacted than poorly graded mixtures and generally have greater stability after compaction. If available, materials which are highly desirable for this use include crushed stone, crushed and uncrushed gravel, sand and crushed slag. As indicated later, many locally available granular materials also have been used successfully.

The portion of the material which passes a No. 200 sieve (fine-soil fraction) functions as a filler for the rest of the mixture and supplies cohesion which will aid in retaining stability during dry weather. If this material is clay, or predominantly so, its swelling will serve to retard somewhat the penetration of moisture during wet weather. The amount of this fine material must be controlled since the presence of

A Potent Factor for *Reducing Highway Costs*

a large amount of it may result in excessive volume change with change in moisture content. This is done by limiting the amount of material which passes a No. 200 sieve. The nature of the fines must also be controlled and this is accomplished by specifying allowable values of the plasticity index and liquid limit. These tests are performed upon the portion of the soil which passes a No. 40 sieve (soil binder).

Frost action must be considered in the design of a mechanically stabilized soil mixture in localities where frost occurs and where the water table is close to the bottom of the stabilized layer. The mechanically stabilized soil mixture must not fall into the category of a "frost-susceptible soil", in order to avoid detrimental frost heave and the other damaging effects of frost action. Soils which contain less than 3 per cent by weight of material finer than 0.02 mm. in diameter are not frost-susceptible. Soils which contain more than 3 percent of material finer than this size generally are susceptible to damaging frost action, except that uniform fine sands which contain up to 10 per cent of material smaller than 0.02 mm. generally are not damaged by frost.

General Applications

As previously indicated, mechanically stabilized soil mixtures may be used as subgrades, bases or surfaces. Several frequently encountered situations may be visualized to illustrate the general application of this method. Assume that the existing surface soil is a loose sand which is incapable of providing support for wheeled vehicles, particularly in dry weather. If a suitable binder soil is available in the area the proper amount may be brought in and mixed with the sand to provide an all-weather (sand-clay) road to carry light traffic. A base may be constructed in a similar fashion.

If the subgrade soil is clay, it may be stabilized by the addition of suitable granular material. Objectives in this case are to improve the drainability of the soil, increase its stability and reduce volume changes.

In one sense the general objective of mechanical stabilization is simply to achieve a combination of available soils which is as near the A-1 group (Revised Public Roads classification system) as possible. In many cases the natural soil may have low stability because of an excess of clay, silt or fine sand. Nearby there may exist suitable granular materials which can be blended with the existing soil. Proper blending may effect a marked improvement in the stability at a comparatively low cost in manpower and materials, and through the use of relatively simple equipment.

The importance of adequate drainage and proper compaction in soil stabilization can not be overemphasized. Many natural soils which, at first glance, may appear to be unsatisfactory can be made to fulfill their intended functions when drained and compacted. If it is determined that soil stabilization is necessary, then adequate drainage and compaction are absolutely essential to proper construction and satisfactory behavior under traffic.

Specific requirements relating to the gradation and plasticity characteristics of mechanically stabilized soil mixtures are given in Table I (5). Values shown in the table are representative of current practice although many organizations have developed their own specifications which differ slightly from those shown.

Requirements relative to compaction are not shown in Table I. Practice varies in this respect with different organizations. Densities attained in the field in this type of construction normally should be not less than 95 percent Standard AASHO maximum density. Higher densities may be readily and eco-

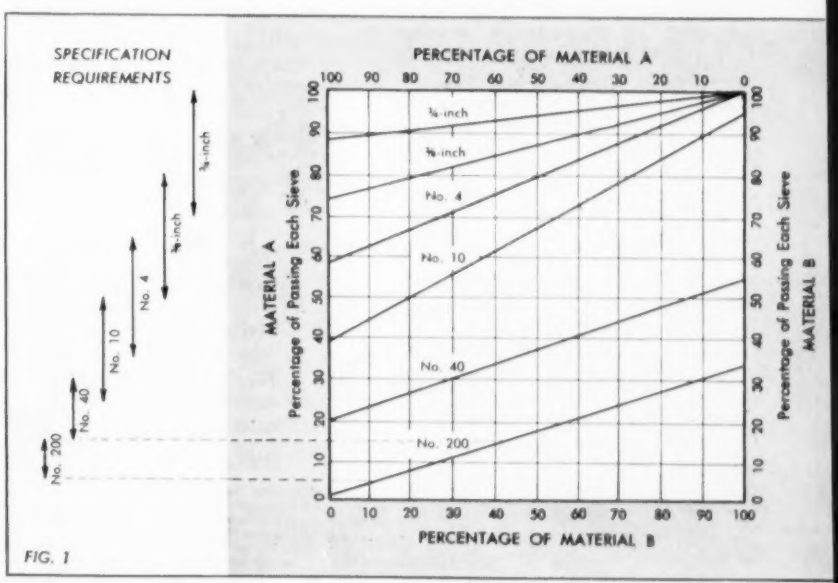


FIG. 1

● **GRAPHICAL presentation of sieve analyses of two materials and results obtained by combining them in various proportions to meet specification requirements.**

nomically obtained in many cases. Standards set by the Corps of Engineers (6) for military roads require the attainment of densities equal to or greater than 95 percent Modified AASHO maximum density. It is normally desirable to maintain the moisture content at or near optimum during compaction.

Use of Local Materials

The essence of mechanical soil stabilization is the efficient use of local materials. Many different materials have been used successfully, including caliche, coral, limerock, tuff, shell, cinders, iron ore, burnt shale, topsoil, mine tailings, disintegrated granite, and many others. When local materials are used it is frequently not possible to comply exactly with the gradation requirements of Table I. If it is necessary to make a choice, it is desirable to satisfy the size requirement of the finer fractions and neglect the grading of the coarser materials.

With regard to soil stabilization, the most important asset which the engineer can possess is an open mind. An open mind will permit him to evaluate the materials around him with a view toward their successful use in stabilization and will lead him to undertake his own experiments to determine the best combinations of locally available materials.

Blending

An important aspect of the design of a mechanically stabilized soil mixture is the determination of the proper proportions of locally available materials to be used. For purposes of explanation assume that a borrow soil is to be used to stabilize an existing subgrade soil to produce a satisfactory base course material. The mechanical analysis and the results of the limit tests must be available for both the subgrade soil and the borrow material. A soil profile is desirable in order to detect variations that may require various designs in different sections of the roadway. Obviously numerous changes in the mixture cannot be made. Generally the worst sample in a considerable length is used as the criterion for that entire section.

The problem then is to determine the proper proportions of the two materials. This is usually done by trial, with the initial trial mixture being based upon a calculation of the combined mechanical analysis. In other words, trial computations are made and the proportions of the two materials adjusted until gradation requirements are met. The plasticity characteristics of the trial combination are then determined and compared with the specification. If these values are satisfactory, then the trial mix will be satisfactory.

The mixture must have satisfactory shearing resistance or "bearing capacity." Compliance with the requirements previously given will, in general, insure adequate bearing capacity, assuming that adequate drainage is provided and the mixture is compacted properly. Bearing capacity will not be discussed further here because of its complexity and the comparatively elaborate test procedures required. The California Bearing Ratio test is an example of a commonly used procedure for determining "bearing capacity". Frost action must be considered when applicable.

In some cases it may be necessary to use more than two local materials in order to obtain a satisfactory mixture. Such a procedure is not generally recommended because of difficulties which may be encountered in obtaining a uniform mixture of more than two materials in the field.

Numerical Example of Proportioning

The process of proportioning will now be explained by the use of a numerical example. Proportioning may be done either arithmetically or graphically. A combination of methods is used here. Material B is the existing subgrade soil while

TABLE 1—REQUIREMENTS FOR MECHANICALLY STABILIZED SOIL MIXTURES

Surface Course Materials

Passing, Sieve Size	Sand-Clay Mortar % by Weight	Coarse Graded Aggregate[a] % by Weight
1-inch	100	100
3/4-inch	...	85-100
3/8-inch	...	65-100
No. 4	...	55-85
No. 10	65-100	40-70
No. 10	100[b]	...
No. 20	55-90	...
No. 40	35-70	25-45
No. 200[c]	8-25	10-25

Plasticity Characteristics: Liquid Limit: Not more than 35; Plasticity Index: Not less than 4, not more than 9.

Base Course Materials

Passing, Sieve Size	Coarse Graded Aggregate[d] Percent by Weight 1-inch Maximum	2-inch Maximum	3-inch Maximum
3-inch	...	...	100
2-inch	...	100	65-100
1 1/2-inch	...	70-100	...
1-inch	100	55-85	45-75
3/4-inch	70-100	50-80	...
3/8-inch	50-80	40-70	30-60
No. 4	35-65	30-60	25-50
No. 10	25-50	20-50	20-40
No. 40	15-30	10-30	10-25
No. 200[e]	5-15	5-15	3-10

Plasticity Characteristics: Liquid Limit: Not more than 25; Plasticity Index: Not more than 6.

a. Gravel, crushed stone or slag.
b. Suggested grading for portion passing No. 10 sieve.
c. The fraction passing the No. 200 sieve should be less than two-thirds of the fraction passing the No. 40 sieve.
d. Gradation for sand-clay mortar base course (Fine Graded Aggregate) will be the same as for the sand-clay mortar surface course.
e. The fraction passing the No. 200 sieve preferably should not exceed one-half and in no case two-thirds of the fraction passing the No. 40 sieve.

Material A is available from a nearby borrow source. The mixture is to meet the requirements given in Table I under "Base Course Materials, 1-inch maximum size." Gradations and plasticity characteristics of the two materials are given in Table II, along with the computed values for the selected combination. Frost action is not a factor in the design.

A graphical method of proportioning this soil mixture is shown in Fig. 1. Using the specification for material passing the No. 200 sieve as an example, it can be seen that from 11 to 44 percent of the material B in the mixture will satisfy the requirements. Using the same method, the following tabulation for the percentage of material B can be made: Passing 200 sieve, 11 to 44 percent; passing 40 sieve, maximum 29 percent; passing 10 sieve, to 20 percent; passing 4 sieve, to 17 percent; passing ⅜-in. sieve, to 24 percent; and passing ¾-in. sieve, to 100 percent. Evidently 11 to 17 percent of material B can be used and the choice will be determined by the cost of the two materials. It will be assumed that 11 percent of B will make the cheapest mixture. This is the least amount that can be used to satisfy the minimum specification requirement for material passing the 200 sieve. Likewise, 17 percent is the maximum that can be used to meet the requirement for material passing the No. 4 sieve. These two proportions are limiting.

TABLE II—Numerical Example of Proportioning

	Per cent passing, by weight		
	Material	*Material*	*89% A,*
Sieve	*A*	*B*	*11% B*
1-inch	100		100
3/4-inch	89		90
3/8-inch	74	100	77
No. 4	58	99	63
No. 10	39	96	45
No. 40	20	55	23
No. 200	1	33	5
Liquid Limit	21	35	24+
Plasticity Index	2	12	4+

An approximate method of determining the plasticity index and liquid limit of the combination will serve to judge if the proposed mixture will be satisfactory, pending the performance of laboratory tests. The method used is given in the box herewith.

Satisfactory mixtures of this kind are difficult to design and build without laboratory control. When testing facilities are not available a rough estimate of the proper proportions may be made on the basis of manual and visual inspection. Water should be added to each of the available soils until it is moist but not wet. In a wet soil the water can be seen as a shiny film on the surface. Trial combinations of the two soils should then be made, being careful to note the proportions. Particles larger than about ¼ inch should be excluded. A desirable mixture will feel gritty and the sand grains can be seen. A cast formed by the moist soil will have some strength and should retain definite shapes even when dried. If the moist soil is patted in the hand it will generally form a strong cast which can not be penetrated easily by a blunt stick the size of a lead pencil. If the moist soil is patted into a container and then allowed to dry it will exhibit little or no shrinkage. If gravel is available it may be added, although there is no rule-of-thumb to tell how much should be used. It is generally better to use too little gravel than too much.

In the field the soils of the example above will generally be proportioned by volume. They may also be proportioned by weight. Assume that the thickness of the compacted layer is to be 6 inches and that a loose thickness of 8 inches will be required before compaction. A more exact relationship can be established as construction proceeds. Of this 8-inch thickness, 8 (0.89) = 7.1 inches will be Material A, the borrow soil. Very little of Material B will be required, about 0.9 inch. The existing soil will be bladed to the side of the road into a windrow. Material A will then be hauled in and spread in a uniform layer. Material B is then bladed back and the two materials thoroughly mixed to a depth of 8 inches It may be difficult to handle such a slight amount of the fine soil with some equipment, but it can be done.

Construction Procedure

The steps which should be followed in the construction of a mechanically-stabilized soil mixture depend upon the equipment available and the soils involved. Preliminary steps, such as the cutting of drainage ditches, shaping of the subgrade to preliminary line and grade, and the removal of organic

Determination of Plasticity Requirements

The approximate equation for determining the Plasticity Index of a mixture of two soils is as follows (2):

$$\text{P.I.} = \frac{(\%\text{A})\ (\%\ \text{Passing No. 40,A})\ (\text{P.I.,A}) + (\%\text{B})\ (\%\ \text{Passing No. 40,B})}{(\text{P.I.,B})\ (\%\text{A})\ (\%\ \text{Passing No. 40,A}) + (\%\text{B})\ (\%\ \text{Passing No 40,B})}$$

For the trial combination chosen for the example in the accompanying text, the approximate value of the plasticity index of the mixture is

$$\text{P.I.} = \frac{89(20)2 + 11(55)12}{89(20) + 11(55)} = 4.5$$

A similar equation may be used to determine an approximate value of the liquid limit; in this case, slightly more than 24.

● **SEAMAN Pulvimixer mixing shoulder material for mechanical stabilization.**

Courtesy Calcium Chloride Institute.

● **MOTOR grader and compacting rubber tire roller.**

Courtesy Barber-Greene Co.

● **MIXING stabilization material in traveling plant.**

material and undesirable soils, must be carefully performed. Sufficient sampling must be done to detect soil variations which occur within the top few inches. This is essential, since soil deposits are normally non-uniform, both in character and extent; variations which occur may be very important to the design.

Two basic methods may be used in the construction of the stabilized soil layer. These are road mixing and plant mixing; plant mixing may be done with a traveling plant or at a central mixing plant. No attempt will be made here to discuss in detail these various procedures, since this information is available in many references. For example, see reference 5 at the end of this article. The general nature of the process is indicated below.

Road Mixing—If the existing soil is sand, it will be scarified and pulverized to the desired depth. The desired amount of binder soil is then brought in, spread uniformly, and the two ingredients thoroughly mixed. In event that the existing soil is clay, it is usually the smaller proportion of the mix. It is then generally desirable to scarify the binder soil, dry it if necessary, pulverize and blade it into a windrow at the side of the road. The granular material is then brought in and spread in a uniform layer. The clay is then bladed back on top of the granular layer and the materials thoroughly mixed.

Calcium chloride or rock salt can be added to the soil mixture. The amount used varies with conditions but is generally ½ pound per square yard per inch of compacted thickness. Calcium chloride, which is a hygroscopic material, serves to aid the compaction process by slowing the rate of evaporation of moisture from the mixture. It also aids in the retention of moisture in the mixture during its service life. This is particularly important for wearing surfaces, since the chloride will aid in maintaining the moisture content which is desired for maximum stability, prevent raveling of the surface, and reduce dust. After construction is complete, regular applications of chloride may be made to a wearing surface as a maintenance measure.

Details of rock salt use are contained in reference 7 of the bibliography.

Thorough pulverization and blending of the soil mixture is absolutely essential. This operation may be accomplished by the use of such tools as blade graders, harrows, discs and rotary mixers. During this step the moisture content of the soil is brought as close to optimum moisture content as practically feasible, preparatory to compaction. It is desirable that the moisture content be maintained within 10 per cent of optimum, although greater tolerances may be necessary in some situations. When mixing is complete the soil has a uniform color and appearance throughout the depth of processing. Frequent samples should be taken in order to detect any significant variations from the desired mixture.

After mixing is complete, the soil is spread in a uniform layer and compacted. Sheepsfoot rollers are frequently used for initial compaction, with final rolling being done by pneumatic-tired rollers.

After compaction the surface is shaped by light blading and rolled with three-wheel (steel) rollers. Rolling is accompanied by light sprinkling as required until the surface is true to line and grade and has a tight, uniform surface texture.

Plant-Mixing—When the necessary equipment is available mixing-operations may be carried out with a traveling plant. Many agencies which construct a large mileage of roads of this type have found it economical and efficient to produce mechanically stabilized soil mixtures at a central plant.

Laboratory Equipment

As has been indicated, the design and construction of mechanically stabilized soil bases and wearing surfaces requires reasonably careful laboratory control. Principal tests which are necessary include mechanical analysis (generally sieve analysis will suffice), the liquid and plastic limits, moisture-density relationships, and field density. Test procedures have been discussed previously (9) and are given in detail in references 10 and 11. Testing equipment required is available from several commercial sources (For example, see reference 8). Minimum equipment requirements can be met at a cost of from $750 to $1000, at current prices.

The following is a list of minimum and desirable additional soil testing equipment for use in connection with the design and control of mechanically stabilized soil mixtures. It should be emphasized that this list is minimal in nature and that more items of equipment may be added as desired and that duplicate items may be needed if laboratory and field operations are being carried on at the same time at separate geographical locations.

Minimum Equipment Necessary

I Liquid limit device, complete with grooving tool

II Standard 8-inch sieves, together with pan and cover;
1 each of the coarse series—3-inch, 2-inch, 1½-inch, 1-inch, ¾-inch and ⅜-inch
1 each of the fine series—U. S. No. 4, 10, 20, 40 and 200

2 Standard compaction molds, 1/30 cubic foot, complete with collar and base

1 Standard compaction rammer, 5½-lb., 12-inch drop

1 Mortar and rubber-covered pestle

1 Metric type solution balance, 20 kg. capacity, or similar laboratory or field scale with capacity of at least 35 pounds and sensitive to 0.1 pound

1 Triple-beam balance, 200+ gram capacity, sensitive to 0.01 gram

1 Electric constant-temperature oven, capable of maintaining temperature between 100 and 110 degrees Centigrade

1 Field density test set, sand meth-

od, consisting of sand cone apparatus and jar, field density plate, 12-inch spoon, 12 1-gallon cans, 100 pounds standard Ottawa sand, sand scoop, trowel or other digging tools. (Note: other similar equipment, such as the rubber-balloon density apparatus, may be substituted, but the sand method is recommended for general application)

— Shallow sampling equipment, of which there are many types—Basic tool recommended for general use is a 4-inch posthole-type soil auger, with extensions and sample bags or cans

6 Evaporating dishes, assorted sizes

2 Spatulas, 4-inch

3 Graduated cylinders, 100 cc capacity

48 Moisture cans (aluminum cans are desirable, but not absolutely necessary)

1 Plastic limit plate (glass)

1 Wire brush for cleaning coarse sieves

1 Fine brush for cleaning fine sieves

1 12-inch steel straightedge

4 Glass beakers, 100 ml. and 250 ml. capacity

1 Thermometer, 0 to 150 degrees Centigrade

3 Mixing pans, approximately 2 by 24 by 24-inch size

1 Book containing test procedures (Recommend "Soil Testing for Engineers" by W. T. Lambe, John Wiley & Sons, N. Y. References 10 and 11 contain standard test procedures)

Desirable Additions

Intermediate sieve sizes, as desired

Hand or electric sieve shaker

Hydrometer analysis set, including soil hydrometer, 1000-ml. glass graduate, mechanical stirrer and deflocculating agent (sodium silicate)

Sample splitter

Modified compaction rammer, 10-lb., 18-inch drop

Standard data sheets

Additional sampling equipment, as required

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Sanitary Fill is Better Than Garbage Feeding

WHEN, in 1953, a state ordinance forbade feeding uncooked garbage to hogs, Grand Rapids, Mich., started a sanitary fill operation. At first there was trouble. Garbage had been collected separately from refuse, the latter being handled by private contractors. The wet garbage would not compact properly and could not be covered satisfactorily. Later, arrangements were made with the private collectors of refuse to dump this at the landfill where it could be mixed with the wet garbage. Using an International TD-14A tractor with Drott bullclam, from 75 to 125 tons of material have been handled daily at the fill.

The 150,000 population of Grand Rapids is served by a fleet of 17 pickup trucks, 8 of which have packer-type bodies. Collections are made daily in the business area and weekly in residential sections. Costs for collections are obtained from an annual tax levy. The 21 acres of swampy land now being used for the landfill is expected to provide building sites later. Three open dumps previously operated are to be converted to the trench-type fill in the near future.

• • •

County Governments Meet Water and Sewerage Needs

County governments in Georgia are becoming increasingly aware of the requirements for water and sewerage in thickly settled areas outside of incorporated cities, according to William H. Weir, Director, Water Pollution Control for Georgia, in his annual report for the calendar year 1953. Facilities for such areas are being planned. During 1953, several joint surveys were authorized by city and county governments to determine the best methods for water supply and sewerage service for these metropolitan areas. Col. Weir considers this a very progressive step toward providing the basic public health services to communities regardless of intervening boundaries of political subdivisions or privately owned industrial areas.

Part Speed Efficiencies of WOUND ROTOR MOTORS

For Bids on Public Works Projects, Wound Rotor Motor Efficiencies Can Be Determined Easily By the Method Outlined Here

G. L. OSCARSON, Chief Application Engineer, Electric Machinery Mfg. Co.

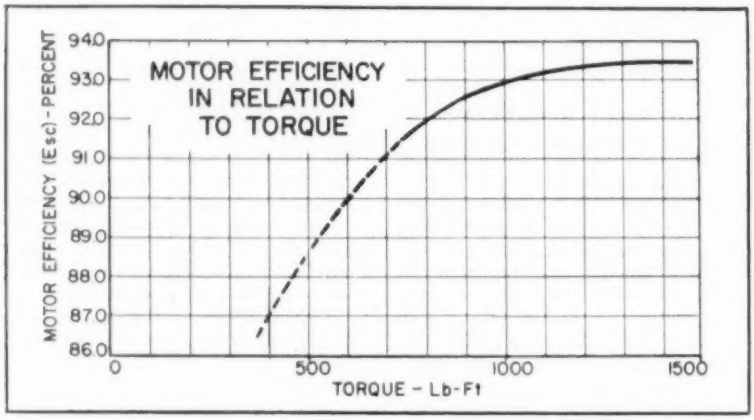
THE major portion of the total loss in a slip coupling, operating at reduced speed, is the slip loss. A wound rotor motor, operating at reduced speed, has a similar loss in its secondary or rotor circuit. The amount of this loss is proportioned to the slip which is in turn dependent on the torque developed by the motor with a given amount of secondary resistance in the circuit, and the torque required by the load.

Since the operating speed and, thus, the slip loss is dependent on the driven load, the load torque values for the speed points in question must be known before part load and part speed efficiencies of wound rotor motors can be calculated.

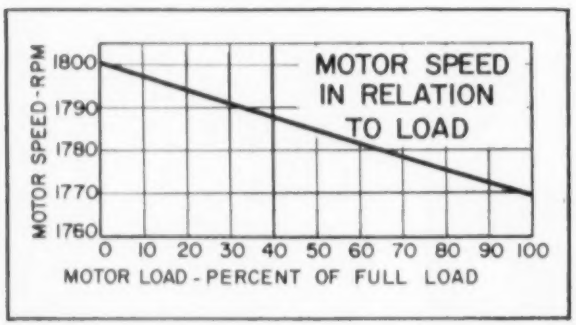
The purpose of this article is to provide a basis for approximating part speed, and part load efficiencies for wound rotor motors, provided the load torque characteristics and the motor efficiencies under short circuited ring conditions (Esc) are known. This is the basis on which data sheet efficiencies are given. The necessary procedure is outlined in the following steps, assuming a 500-hp, 1770-rpm motor driving a pump with a torque characteristic as per Figure 3 shown below.

Outline of Procedure

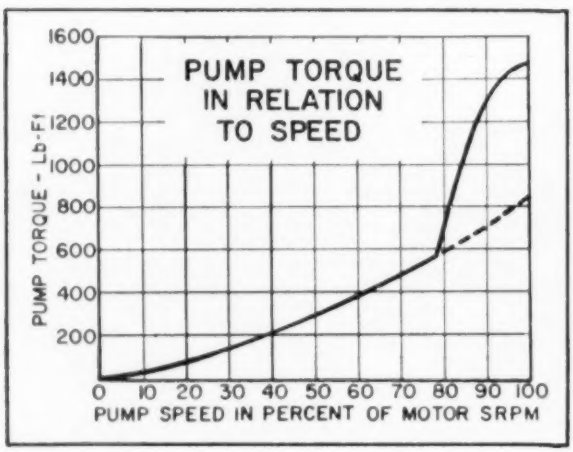
1. First plot Figure 1 on the assumption that the slip is zero at zero load and that the relation between slip and load is linear between that point and full load. This



● **FIG. 2 is plotted using torque as determined by method on facing page.**



● **FIG. 1 above is plotted on the assumption that slip is zero at zero load and the relation between slip and load is linear. Fig. 3, right, is the load torque curve used to work out the problem described in the accompanying text.**



establishes the following values:

Per Cent Load	*RPM*
0	1800
25	1792.5*
50	1785*
75	1777.5*
100	1770

*Note: These are approximate values obtained from Figure 1.

Then calculate the torque values, using rpm values from Figure 1 and the formula:

$$\text{Torque} = \frac{5250 \times \text{HP}}{\text{RPM}}$$

F. L. Torque $= \frac{5250 \times 500}{1770} = 1485$ lb. ft.

¾ L. Torque $= \frac{5250 \times 375}{1777.5} = 1090$ ft. lb.

½ L. Torque $= \frac{5250 \times 250}{1785} = 735$ lb. ft.

¼ L. Torque $= \frac{5250 \times 125}{1792.5} = 366$ lb. ft.

If full load slip exceeds 3 per cent the error in assuming a linear relationship between slip and load may be appreciable. Such cases should be checked with the Works.

2. Plot Figure 2 using torque, as determined from above calculations, as the abcissa and data book efficiency (Esc) as the ordinate. For instance the data book efficiency for half load is actually the value for the torque corresponding to half load and should be so plotted in Figure 2. The values to be plotted in this case are:

Torque	*Eff.*
1485	93.4
1090	93.1
735	91.4
366	86.4*

*Note: In many cases it may be necessary to estimate efficiencies at less than half load. In motors 200 hp or above, 4 to 10 pole, subtract 5 points from half load efficiency; in motors 200 hp or above, 12 to 18 poles, subtract 8 points from half load value.

3. Plot the load torque curve in Figure 3 using the pump speed in percent of synchronous rpm of the motor as the abcissa, and torque required in pound feet as the ordinate.

4. Prepare the tabulation shown in Table 1 herewith.

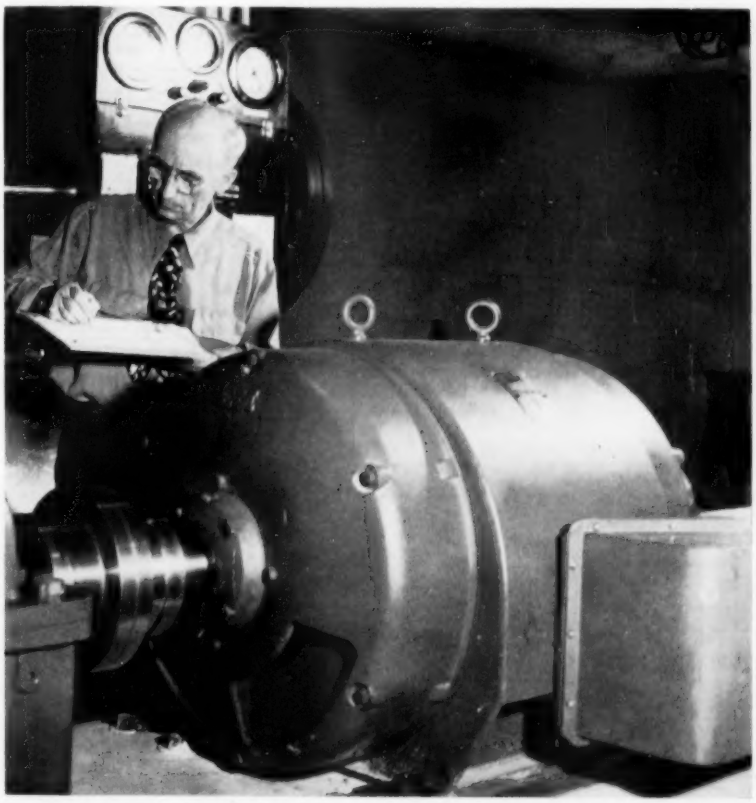
Where Column 1 = Load torque of driven equipment at sufficient number of points to establish the curve; Column 2 = Motor speed, in percent of synchronous rpm, at load torque points in Column 1 (from Figure 3); Column 3 = Motor efficiency, with short circuited rings, at load torque points in Column 1 (from Figure 2);

Table I—Torque, Speed and Efficiency Relationships

(1) *Load Torque in Lb. Ft.*	(2) *Percent SRPM*	(3) *Esc*	(4) *1-S1*	(5) *1-S2*	(6) *Percent Eff.* $= \frac{1-S2}{1-S1} \times Esc$
1455	98.3	93.4	.983	.983	93.4
1350	92.4	93.3	.983	.924	87.6
1200	87.7	93.1	.983	.877	83.0
1000	84.5	92.9	.983	.845	79.7
800	82.0	91.9	.983	.820	76.6
578	78.0	89.8	.983	.780	71.3

Column 4 = Full load speed (1-rotor slip) expressed as decimal $\frac{1770}{1800} = .983$; Column 5 = Percent synchronous rpm in Column 2, expressed as decimal; and Column 6 = Approximate part speed efficiency = $\frac{\text{Column 5}}{\text{Column 4}} \times$ Column 3.

The torque curve in Figure 2 is, in general, typical of pump application in which the pump must attain a fairly high speed before the water column is put in motion. The efficiency is not calculated below that speed. However, this same general method is applicable to any type of load over any speed range.



● **CHECKING** the performance of a motor in operation in the plant.

In utilizing the information in this article, it is necessary to have the motor manufacturer's data book in order to obtain the full speed, full load efficiency of the motors. This is basic and there is no way to avoid this procedure.

FLUORESCENT LUMINAIRE FOR INTERSECTIONS GIVES RESULTS

ROY MATTHEWS,

Senior Electrical Engineer, Traffic Department
California Division of Highways

Illustrations and text courtesy of California Highways and Public Works

THE fluorescent highway luminaire developed by the Traffic Department of the Division of Highways is designed for use at intersections only. It is mounted at the far right corner of the intersection and is so constructed that most of its light rays are directed back into the intersection.

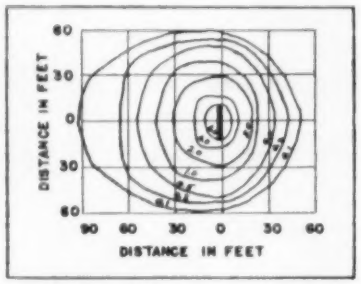
The isolux curve of horizontal foot-candles for this unit when mounted at a height of 30 feet, shows the pavement directly underneath the luminaire is illuminated to a level of approximately 7 foot-candles. This is about twice as much light as obtainable with the common 20,000-lumen mercury vapor street lighting luminaire.

The fluorescent luminaire is constructed of 16-gauge sheet steel. The underside of the unit is white porcelain enameled finish and the top of the unit is dark green porcelain enameled. The reflector is of the open type, that is, there is no glass cover.

Fluorescent lamps are usually designed to give the greatest light output at about 70 degrees Fahrenheit. It was first believed that the use of an open reflector such as used in this unit would not be practicable because the light output of the lamps would decrease with cool winter night temperatures. However, no visible decrease in light output has been evident.

Although most of the light is directed back into the intersection there is also quite a bit off the ends of the unit. Some of this light could probably be redirected back into the intersection, if desired, by the addition of a reflecting surface at the end of the unit.

A daytime view of the intersection of Auburn Boulevard (U. S. 40) and Watt Avenue, a few miles northeast of Sacramento, is shown herewith. Four of the fluorescent lights are used at this location. Two units are used at the intersection proper in the prescribed manner, and two others are used to illuminate the entrance to the left turn lanes on both approaches to the intersection.



● **ISOLUX LINES of horizontal ft-candles using a Model 100 fluorescent intersection luminaire.**

The units provide good illumination of the intersection, but by far the greatest asset is the lack of glare. According to the Illuminating Engineer Society, there is no single factor so detrimental to visibility in roadway lighting as glare. Glare not only results in a reduction in visibility but also produces eye discomfort and fatigue.

A night view of the same intersection is also shown. The photographer was located fairly close to the first unit, which illuminates the entrance to the left turn lane. The brightness shown by this unit in the photograph would be cut off from the view of a driver by the vehicle's top. The remaining units shown illustrate the view of the approaching driver. Note that only a small horizontal line of light is visible to the motorist and this is of such small area that the motorist's visibility is not hindered.

● **DAYTIME view of the intersection of Auburn Boulevard and Watt Avenue northeast of Sacramento. Four units used.**

● **A NIGHT VIEW of the same intersection taken from a point near to the lighting unit which illuminates the left turn.**

CONCRETE JOINT MAINTENANCE in Ohio

● FILLING joint with cold application joint filler.

● REMOVING old filler and cleaning joint with broom

● COVERING fresh filler with paper to prevent pick-up.

TO a limited extent, during 1951 and 1952, the Ohio Bureau of Maintenance used a cold-applied, ready-mixed rubber sealing compound instead of the hot-poured type sealing compound used in the construction operations. Later, on the basis of the service obtained, it decided to use more of the rubber compound.

A rooter was developed in a Division Maintenance Garage for removal of old joint material and rooters were made by this garage for seven Divisions. The machine is propelled with a small garden tractor, powered by a 4.2-hp. gasoline engine. A clutch and two-speed drive were developed so as to get the necessary control and speed while using the machine and while traveling from one joint to another. A quick detachable drawbar was designed with a tool for removing the old material. In designing this tool is was necessary to consider the various types of joints on which it would be used. Many joint assemblies used in Ohio have a metal parting strip which is installed one-half inch below the surface of the pavement. On older projects the groove is impressed one-third the depth of the slab.

The width of the groove varies widely due to construction practices and the amount, if any, that the concrete is contracted when the joints are cleaned. For several years the Department has used contraction joints spaced at 100-foot intervals. On this type of construction the width of the joint opening can vary in the neighborhood of one-half inch depending on climatic conditions. It was considered desirable to scrape the pavement surface on both sides of the joint to remove excess filler. This scraper also sheared off the rooted filler where it was still bonded to the concrete. This was done by making the rooter tooth rigid and the scraper to operate up and down within limits. The rooter tool is supplied in various widths from one-quarter to three quarter inches by one-sixteenth-inch increments. The tool used should be the one that passes through the joint without excessive side friction and tools can be changed to the width tool required in 30 seconds, the same holder being designed to hold any width tool in the above range.

After rooting, the joint is cleaned by a rotary brush mounted behind the rooter. This is constructed with an aluminum assembled hub filled with steel wire street broom bristles. This brush is approximately 15 inches in diameter and 6 inches wide with a loaded pressure sufficient to make it sweep out the joint and clean the pavement surface on each side of the joint. The brush is designed so that it can be easily filled with new wire when necessary.

A counterweight is mounted on the front of the machine to give sufficient weight for traction. The counterweight serves as a support when the machine is standing idle, keeping the engine in a plane which prevents it from stopping.

During 1953 the Bureau of Maintenance somewhat extended the use of the cold-applied ready-mixed rubber compound in its maintenance operations. A technical specification No. M-110.26 was adopted and material meeting it was shipped in 55-gallon drums. After the joints were cleaned, the sealing compound was pumped directly from the shipping drum through the applicator to the bottom of the joint. Air pressure operated pumps, with 18 to 1 and 24 to 1 operating ratios, have been successful with an air pressure of 100 pounds per square inch. With a pressure of 125 pounds per square inch an 8 to 1 ratio pump might be used. On one project the average air temperature was approximately 30° F. and the average material temperature was 40° F. At these low temperatures the joint, approximately ½ inch wide by ⅝ inch deep, was filled at the rate of about 15 linear feet per minute. No heat was used in the operation.

Some of the joints were covered with dolomitic lime dust. If vehicles crossed the joints immediately, there was some tire pick-up. Kraft paper, 4 inches in width, was placed over other joints and there was no pick-up by vehicles passing over these joints.

This method of joint cleaning and sealing was developed by C. W. McCaughey, Deputy Director of Operations and J. W. Reppel, Engineer of Maintenance.

FILLING DEVICE for STREET SWEEPER BROOMS

ALBERT R. KARR

REWINDING of street sweeper brooms has been turned into an eight-minute operation by a feeder attachment invented by W. J. Mullins, city maintenance superintendent for Eugene, Oregon. The device has enabled the city to speed up its sweeper broom replacement to the point that it takes only an hour to remove the worn broom from the sweeper, unwind the old fibers, rewind new fibers, and replace the broom on the sweeper.

Representatives of two national companies have said that the machine, with Mullins' feeder, winds the fibers onto the core better and quicker than do the machines now in use. And another, the Albin Manufacturing Co. of Seattle, Washington, has made preliminary arrangements to build similar feeding equipment for attachment to any kind of winding machine.

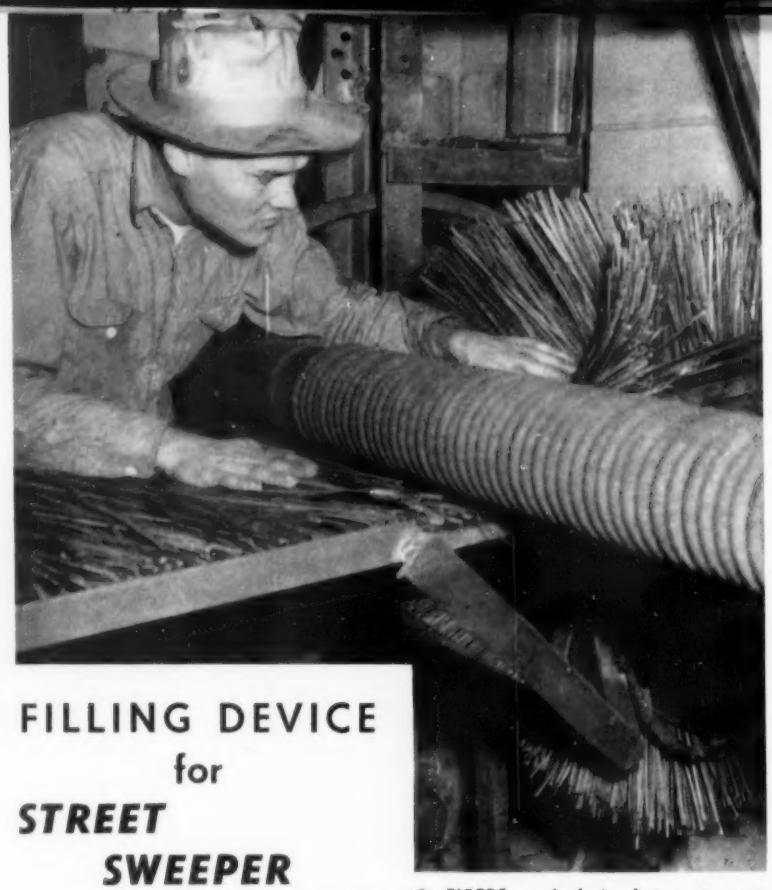
Mullins' invention feeds fibers, soaked in hot water for softening, along two narrow belts fixed with short spikes to keep the fibers in place. The carriage supporting the belts moves in synchronization with two revolving drums on the machine, one holding a cable for winding the fibers onto the broom core, and the other holding the broom core itself. The belts pass under the cable, turning sideways and directing the centers of the fibers under the cable and into the grooves on the broom core. There the cable takes over, pulling the fibers firmly into the grooves, where they remain tight, ready for sweeping. On most broom rewinding machines, the fibers have to be placed under the cable manually, and directed by hand into the grooves.

Prior to obtaining the basic rewinding machine to which Mullins has attached his feeder device, the process of replacing worn brooms required from eight to twelve hours. One man would feed fibers into the grooves on the broom core; and another would operate a foot lever, forcing the fibers into place. The process required manual turning of the core, and did a job inferior to the present one.

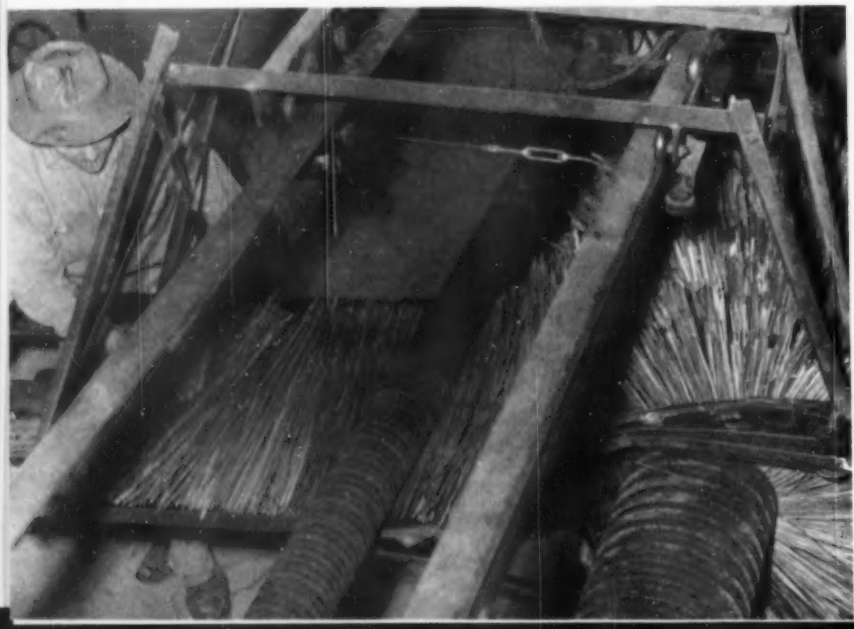
Unwinding of the old fibers from the broom takes only two or three minutes. The cable on the fore-drum merely whips the old fibers off the core while the machine revolves the drums.

In addition to the plaudits from national street sweeper companies, Mullins has received queries from cities throughout the nation, including Chicago, Los Angeles, Detroit, and Washington, D. C. As far as he knows, the system is still used only in Eugene, where it provides quick broom rewinding for that city, the nearby city of Springfield, the coast cities of Coquille and North Bend, and the state highway department's Eugene headquarters.

He has applied for a patent for the feeder invention, to be constructed by the Albin Manufacturing Co., 3626 E. Marginal Way, Seattle.



● FIBERS soaked in hot water are forced into grooves in the core by cable.



● TWO narrow belts carry fibers and guide them into core grooves.

APWA News

AMERICAN PUBLIC WORKS ASSOCIATION
1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Research Foundation Established By Association

Methods and techniques to reduce costs and provide greater service to public will be investigated by projects administered under auspices of APWA

One of the most significant actions taken by the Board of Directors at its recent meeting in Chicago was the establishment of a Research Foundation to be administered under the auspices of the APWA and supported by voluntary grants from private industries and governmental jurisdictions who are interested in specific research projects.

It was estimated at a Trade Association Conference in Chicago last year that 25 to 30 million dollars are spent by trade associations annually in technical research of special interest to their members. Very little, however, is spent on technical research on many of the problems that continually plague the public works official. The purpose of this new Research Foundation is to provide a means whereby all interested parties can contribute to research on specific problems in an effort to find new methods and new techniques to reduce costs and provide greater service to the public.

It is contemplated that proposals covering specific projects will be presented to educational institutions who have the facilities needed to conduct the desired research. All contributors to the Research Foundation will receive periodic progress reports on the status of specific projects. Further details of the new program will be announced at the Annual Public Works Congress in Atlantic City, New Jersey, September 19-22, 1954.

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CHAPTER MEETING NEWS

Michigan:—Sixty members and guests attended the January meeting of the Michigan Chapter at Huck's Redford Inn in Detroit. The meeting featured a talk by Edward W. Bauman, Managing Director of the National Slag Association whose subject was "Advance of Slag in Bituminous Mixtures".

New Orleans:—Colonel Shelton P. Hubbard, Director of the Department of Public Housing Improvement and Slum Prevention explained the progressive steps taken by the City of New Orleans in its slum rehabilitation program at an evening meeting of the Chapter on February 2nd.

Philadelphia:—Edmund N. Bacon, Executive Director of the City Planning Commission of Philadelphia presented an interesting illustrated talk on "Penn Center" following a dinner meeting of the Chapter at the Engineers' Club of Philadelphia.

Florida:—A recent survey conducted by Raymond A. Williams, Director of Public Service, Miami, shows that APWA members in that state favor the early formation of a local chapter.

Wisconsin:—Peter Burbach, City Engineer of West Allis and President of the new Wisconsin Chapter recently appointed John Dever, City Manager of Two Rivers to head a Committee to develop a manual on "How to Prepare a Public Works Report".

Arizona:—Edward E. Tufte, Civil Engineer of the Phoenix Public Works Department and new State Chairman for Arizona is circulating a petition for the establishment of a new chapter in that state.

Northern California:—The first luncheon meeting of 1954 was held January 15th in Oakland with about 40 members and guests present. An entertaining program was arranged which consisted of talks by Carl G. Heine, Division Engineer for the Pacific Telephone & Telegraph Company, and his associates. The intricate operations of the Company's new automatic message accounting equipment was described in detail. The excellent presentation of this fascinating subject gave members a welcomed relief from the more customary workshop type of program.

Film of The Month

"Autopsy of An Auto Accident" is the name of a film which shows the *black* side of the street lighting story. The *light* side of the story is suggested as the film of the month. The name of the film is "There's Danger In Darkness". It is a 35 mm soundslide film pictured in black and white. A 33 1/3-rpm turntable is required for this film which deals with the advantages of adequate street lighting and benefits to be gained from the installation of properly designed equipment. This and other films on street lighting are available on loan from: Film Division, Westinghouse Electric Corporation, Box 868, 511 Wood Street, Pittsburgh 30, Pennsylvania.

RESULTS OF CAPITAL IMPROVEMENT SURVEY

Projects Already Planned Near Five Billion Dollar Mark

The results of a recent survey of capital improvement programs of municipalities for 1954-58 have just been released by the Municipal Finance Officers Association. The APWA and several other organizations cooperated in conducting the survey for the Presidents' Council of Economic Advisors. Questionnaires were mailed to 334 municipalities with populations over 10,000.

For the five-year period 1954-58, 141 cities reported a dollar volume of planned projects totalling nearly 5 billion dollars. Of this amount about 25% is to be expended in 1954 with the balance spread over the next four years.

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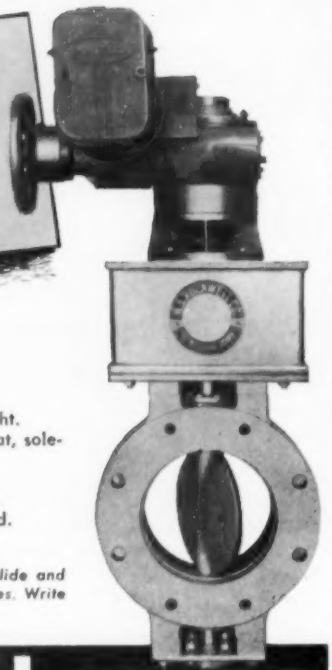

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Easy to afford this truck-crane

This versatile new low-cost hydraulic truck-crane, the Pitman Hydra-Lift, can be used economically by contractors, counties and cities for scores of lifting jobs not heavy enough to justify a larger, more expensive crane. And Hydra-Lift does these jobs much more quickly, much more easily.

Hydra-Lift mounts on any truck, 2 tons or larger. Because it takes only 40" behind the cab, the truck can still be used to carry its normal payload; the truck retains all its mobility.

Lifting capacity is 6,400 pounds; hydraulic power swings boom 180°, lifts it through an arc of 100°. Boom telescopes from 12 to 22 feet. Write today for complete information on the low-cost Hydra-Lift.

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All traditional methods of financing will be used with cities relying heavily upon general obligation bonds but with a growing tendency to finance some of the costs of capital improvements from current revenues. The survey indicates that cities under 250,000 population expect to use revenue bonds more than the larger cities to finance their capital improvement programs.

Borrowing Margin Remains

Almost all municipalities reporting have some borrowing margin within present debt limitations. For individual municipalities the borrowing margin is comparatively small, but does not appear to constitute an obstacle to the continued issuance of bonds for capital improvements.

Of the 66 cities reporting, 27 indicated that construction could expand if debt and tax limitations were not in effect. The amount of the expansion, however, would represent only about 15 percent more than the 5 billion dollar program currently planned by the cities reporting in the survey.

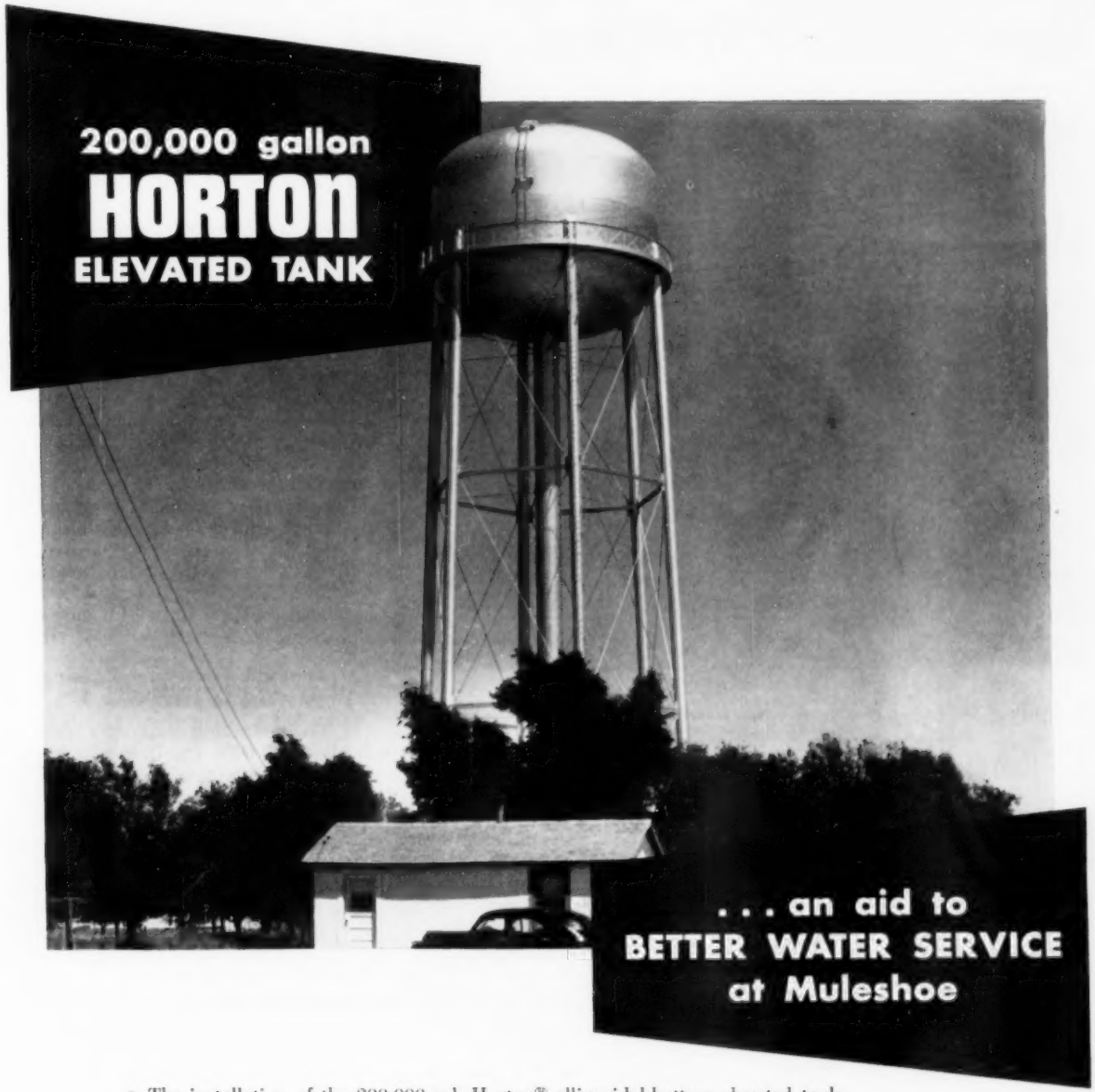
Work Going at Peak Rates

On the other hand 34 cities indicated that construction would not be expanded beyond that now contemplated even if tax and debt limits were lifted. Three reasons were given by cities expressing this latter viewpoint: (1) Planned construction is at such a level that more could not be undertaken because the municipality does not have the capacity to supervise additional work and/or the contractors are not in a position to handle additional work. (2) Continuation of a prevailing policy to provide improvements only to the extent that this will not result in an increase in outstanding debt or a raise in taxes. (3) Adverse economic conditions would limit the amount that the taxpayer could pay or the amount of debt the city could incur without impairing its credit rating.

Land acquisition apparently will not hinder construction of the planned projects. Fifty-four cities representing 77 percent of those reporting indicated that they own or control at least 75 percent of the land required for the projects planned for 1954. About 60 percent of the cities also own or otherwise control 75 percent or more of the land needed for planned projects during the subsequent period of 1955-58.

Plans Already Prepared

At least half of the plans, drawings and specifications are now ready for about 36 percent of the dollar volume of the capital improvement programs reportedly planned to be constructed during 1954-58. Expansion of projects, however, would not be unduly delayed because of the lack of such detailed plans and specifications. In fact, nearly two-thirds of the cities reporting indicate that a backlog is actually growing since construction is not proceeding as rapidly as is the preparation of plans and specifications.



• The installation of the 200,000-gal. Horton® ellipsoidal-bottom elevated tank shown above in the municipal water system at Muleshoe, Texas, brought several important benefits to the community. There is now an adequate reserve of water on hand at all times to meet demands for use in homes, plants or fire protection. It maintains more uniform pressures in the mains during peak load periods.

If your municipal water system is being outdistanced by population growth, seasonal water demands or other reasons, investigate the possibility of a Horton elevated tank helping to solve your problems. Write our nearest office for further information, estimates or quotations. There is no obligation.

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Cleveland 14.....2221 Midland Bldg.	Salt Lake City 4 ..539 West 17th South St.
Detroit 26.....1536 Lafayette Bldg.	San Francisco 4.....1525-200 Bush St.
Havana .....402 Abreu Bldg.	Seattle 1.....1339 Henry Bldg.
Houston 2.....C & I Life Bldg.	Tulsa 3.....1641 Hunt Bldg.

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Lighting and Traffic Control

Atlantic City PRESS Photo

● **DEDICATION of color-corrected mercury vapor lights on the famous boardwalk.**

Fluorescent Lighting for Atlantic City Boardwalk

FLUORESCENT mercury lighting has been installed on a portion of the Atlantic City, N. J., boardwalk, marking the Centennial Celebration of the resort and the Diamond Jubilee of Light. The 123 new fixtures are on a two-mile section of the walk; 88 of them are 30 ft. high to light the wider portion of the walk, and the other 35 are 24 ft. high. The taller installations use Westinghouse OV-60 luminaires and produce 33,000 lumens; the 24-ft. units produce 19,000 lumens.

The new color-corrected mercury vapor lights give an exceptionally brilliant illumination. The lights and standards were installed by the Atlantic City Electric Co. The city pays for the current, which will amount to about $83 per lamp per year.

Philadelphia Street Lighting

At present about five percent of the street lighting in the city of Philadelphia is owned by the city and the remainder by the Philadelphia Electric Company. The Electric Company is now completing the installation of about 800 mercury vapor lights on North and South Broad Street, one of the longest main steets of any city in the world. Negotiations are now under way whereby the city will take over the ownership of all street lighting about the middle of 1954.

Protection at Street Crossings

To protect pedestrians, Chewelah, Wash., has initiated an educational program that has been highly effective. On Main Street, which is also the State Highway, they have adequately painted cross-walks; and through an educational program carried on by the police department, drivers have been instructed to stop whenever a pedestrian enters the cross-walk. In addition to properly painted and signed cross-walks, other steps have included overhead warning lights and the placing of strategically located stop signs in the streets during peak hours. Inasmuch as the problem is primarily one of educating drivers, particularly the teen-agers, it is also suggested, as a long-range solution, that driver training courses be included in the high school curriculum.

England Tries First Parking Meters, Imports from U.S.

England's first parking meters—imported from the U. S. for $89.60 each—will be installed at Leicester, the *American Municipal Association* has learned. Fifty of the meters have been bought for use there. Charge will be a sixpence coin for Britons to park their cars two hours. The amount is about the same as seven cents in American money.

Traffic Control Demonstration Unit

THE General Electric demonstration car is touring the United States and plans have been made to cover the entire country in about two years.

The interior of the car is fitted up to demonstrate several of the standard systems of traffic control manufactured by GE. The unit spends about a day in each city visited, invitations are sent to the municipal officials, and experts discuss the control devices with the help of animated charts. If it comes your way don't fail to see it for it is well worth while.

● **EXTERIOR and interior views of the General Electric demonstration car.**

Only Clay Pipe is completely unaffected by these 16 common industrial acids

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Take any section of Vitrified Clay Pipe into a testing laboratory. Soak it in these corrosive industrial acids—any mixture or any concentration. "Cook" the pipe in boiling acid. Immerse it in aqua regia. Run a stream of acid through the pipe for weeks or months or years. Even before the tests begin, you know the results: *Clay Pipe is completely unaffected by acids and other corrosive elements!*

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C-954-1

Now's the time to mail this month's Reader's Service card.

Sanitary Landfill Costs 63.4¢ per Ton of Refuse

B. R. FULLER,
City Manager, Eagle Pass, Tex.

BEFORE the introduction of a sanitary landfill in Eagle Pass, garbage and refuse had been disposed of by burning on an open dump southeast of the city. Since the prevailing winds are strongly from the southeast for about nine months of the year, odors, flies and smoke were constant nuisances. During the winter months, strong winds from the northwest scattered paper and other refuse over a wide area, and limited burning to early morning or a short afternoon period. Bits of burning material were often scattered by winds, causing small fires. It was necessary to keep one man full time at the site to burn the material when it was safe to do so, and to prevent widespread scattering of the refuse. At additional expense, a fence was built to reduce scattering.

In April, 1952, it was determined to employ the sanitary fill method and bids were asked on equipment. The contract was awarded to the Jess McNeal Equipment Co. of San Antonio, for a TD-9 International tractor equipped with a Model 9-C Drott bullclam. This equipment went into operation on the 14th of May under supervision of a factory representative who trained the City's operator. Full independent operation began on May 19. Following is the cost of collecting and of processing the disposal of refuse for the period 14 May, 1952, to 31 March, 1953. Tonnage is estimated since the contract hauler does not bring uniform loads to the fill. However, it has been estimated with care and is believed to be accurate.

DISPOSAL—Initial cost of equipment was $9,526.88; allowing a 20 percent yearly depreciation, the actual cost of gas and oil ($419.36) and the cost of repairs and supplies ($75.42), the total mechanical equipment charges were $2,400.12. The labor cost of the operator for 1968 hours amounted to $1,500.95. This gives a total cost for disposal of $3,901.07. There were an estimated 6,150 tons of refuse disposed of. The cost per ton for disposal amounted to 63.4 cents.

Collection costs, on the contract for collecting refuse and garbage totalled $12,285.00. The cost per ton for collection was $1.997; and the total cost of collection and disposal was $2.631.

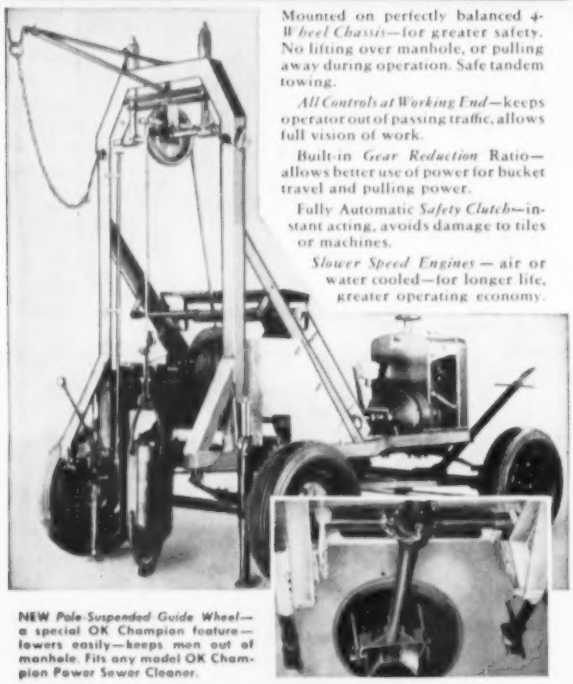
Editor's Note: Mr. Fuller says that the garbage at Eagle Pass is the driest he has ever experienced in any city and that the tonnage handled is no indication of the volume of wastes. He also adds that the Eagle Pass operation has received many favorable comments.

• • •

Traffic Signals Now on Wheels

Topeka, Kan., has movable traffic signals in use. The signals are set on rollers and can be quickly installed at any location, ready to be shifted to another place when the need for them has passed, according to the International City Managers' Association. The signals are equipped with an automatic storage battery which does not have to be recharged more often than every 24 hours.

OK CHAMPION POWER SEWER CLEANERS



Mounted on perfectly balanced 4-Wheel Chassis—for greater safety. No lifting over manhole, or pulling away during operation. Safe tandem towing.

All Controls at Working End—keeps operator out of passing traffic, allows full vision of work.

Built-in *Gear Reduction* Ratio—allows better use of power for bucket travel and pulling power.

Fully Automatic *Safety Clutch*—instant acting, avoids damage to tiles or machines.

Slower Speed Engines—air or water cooled—for longer life, greater operating economy.

NEW *Pole-Suspended Guide Wheel*—a special OK Champion feature—lowers easily—keeps men out of manhole. Fits any model OK Champion Power Sewer Cleaner.

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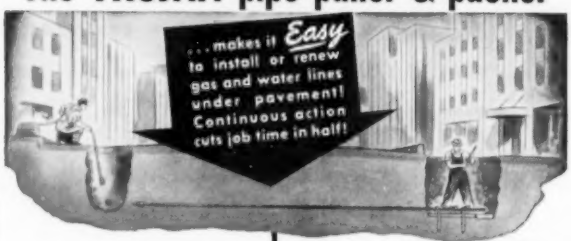
The TROJAN pipe puller & pusher



MODEL A for ½" to 1" pipe

MODEL B for 2" pipe and under

WRITE TODAY FOR FULL DETAILS

With a Trojan, no resetting of grip is required—job goes twice as fast. Heavy duty, all steel construction makes it 4 times stronger than cast iron pusher.

Model A needs only 5 ft. trench. One man can easily lift it in and out of trench and install the average service. 15 tons of pushing pressure possible.

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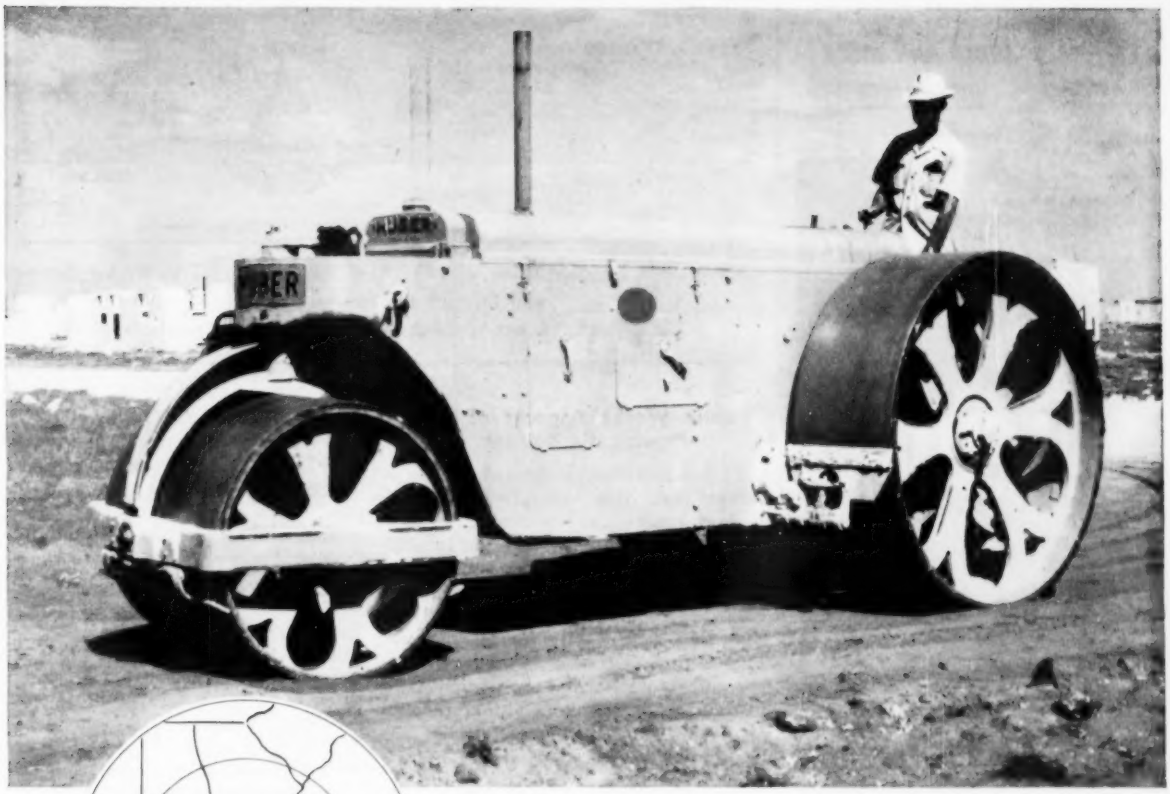

Florida Contractor Holds a winning Pair... TWO HUBERS

SECOND HUBER 10-TON ROLLER HELPS FIRM EXPAND

A Miami, Florida contractor who has built streets for many residential developments is the owner of two Huber rollers — a winning pair.

Five years ago the company bought its first Huber 10-ton three-wheel roller. The second one was added in 1951.

The procedure used on many projects is to sprinkle and roll an 8-inch course of lime rock to a smooth, hard surface which then is swept and sealed with asphalt at the rate of 3/10 gal. per square yard. This is covered with screenings or coarse sand.

This firm's experience with Hubers is typical, for Huber rollers make friends wherever they are used. Expert design and quality construction pay off in terms of fast, powerful and dependable service. Talk to your nearest Huber Distributor about dependable Huber road machinery. You, too, will like it.

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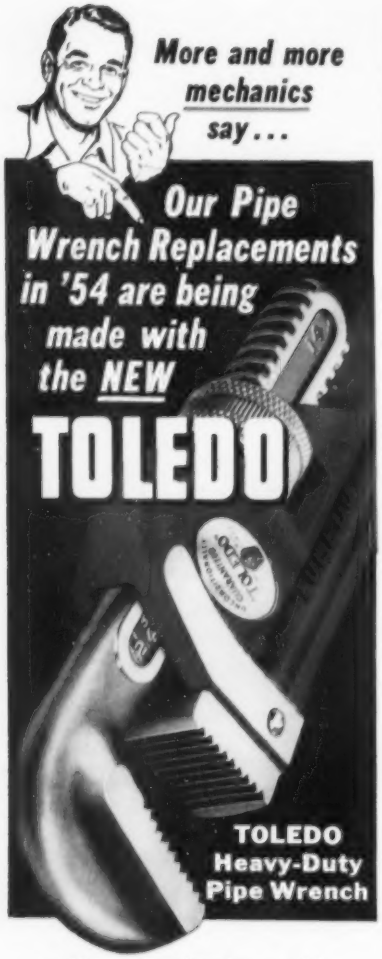

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Just introduced — and making friends fast! See 'em—try 'em on your next job!

New Toledo Wrenches speed the work with easy handling . . . instant non-slip grip on pipe . . . replaceable jaws with spin-easy nut and single spring for quicker, easier setting . . . improved handle design for increased strength, better hand-grip. 6" to 48" sizes.

Unconditionally Guaranteed! If wrench housing or hook ever breaks or distorts, we will replace it Free. Write for new catalog. Order through your supply house. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

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TOLEDO

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Washington news

Presented in cooperation with the American Public Works Association and through the courtesy of the Washington Office of the American Municipal Association.

Public Works Aspects of the President's Budget

In his message, President Eisenhower told the Congress "This budget marks the beginning of a movement to shift to State and local governments. . . Federal activities which can be more appropriately and more efficiently carried on in that way. . . In those cases where Federal participation is necessary, the effort of this administration is to develop partnerships rather than an exclusive and often paternalistic position for the Federal Government." Here are some of the details:

Airports: "Pending completion of current studies, no provision is made in the budget for additional appropriations for grants to State and Local governmental units for airport construction . . the time has come when consideration should be given to requiring the users of the airways facilities to share the cost of providing this service."

Highways: "We should give increased attention to eliminating the existing inadequacies of the national system of interstate highways. Pending development and review of detailed proposals for extension of the Federal-aid highway program, I am including under proposed legislation the $575 million level of existing authorization." Thus the President proposed to continue to make available $137½ million for each of the next two years for Federal-aid urban projects.

Defense Housing & Community Facilities: No additional funds for defense housing were requested; $70 million has been appropriated for this purpose; 82 projects with 15,021 units will be built. The President said that "No appropriations are being requested at this time for new loans (for community facilities) to public agencies." A broad new program for **advance public works planning** was suggested by these words: "To encourage State and local governments to prepare for possible future expansion in public works construction, I am recommending legislation to authorize Federal advances to them for planning for future construction. If the authority is granted, I shall request a supplemental appropriation for the fiscal year 1954 of $10 million with estimated expenditures of $3 million in 1955."

Slum Clearance: "Too many families in our cities today are living in sub-standard housing in deteriorating and slum neighborhoods. . . . Net expenditures in 1955 are estimated to rise to $48 million. . . Effective progress in redeveloping our cities will require (1) enlistment of greater local and private participation; (2) slum prevention as well as elimination and (3) rehabilitation of rundown houses and neighborhoods. I shall recommend legislation broadening the present program to authorize loans and grants for the conservation, rehabilitation and renewal of neighborhood areas . . . aids . . . should be provided only in areas where the local community has adopted and is carrying out its part of an effective program to arrest urban decay."

Public Housing: "As an interim measure, however, the present public housing program should be continued at the level considered necessary to meet the needs of low-income families, particularly those displaced by slum clearance and urban redevelopment activities. Accordingly, my recommendations . . . would authorize construction of approximately 35,000 low-rent public housing units. . ."

215 More Communities Add Fluoride

A report from the U. S. Public Health Service shows that fluoride was added to the water supplies of

$6,750,000,000 of new schools annually for the next 10 years!*

$8,000,000,000 of new highways annually for the next 10 years!*

$1,800,000,000 of water and sewerage facilities annually for the next 5 years!*

America's community needs ...*they can be met now*

The construction industry *now more than ever* has the capacity and experience to build these needed facilities quickly, efficiently and economically.

The general contractor who displays the A. G. C. emblem has the proven Skill, Integrity and Responsibility to execute and coordinate the construction operations.

$1,500,000,000 of new hospitals annually for the next 10 years!*

*Minimum annual community needs as reported to the Congress by the President in his Economic Report, January 28, 1954

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NATIONAL HEADQUARTERS, MUNSEY BUILDING, WASHINGTON 4, D. C.

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215 more communities during 1953. This is considerably less than the record number of 329 places that began this practice during 1952. The report shows that a total of 852 places serving nearly 16 million people were adding fluoride to their water supplies at the end of 1953.

Water & Sewerage Construction Estimated at New High

Preliminary reports from the U. S. Department of Commerce show that contracts totalling $380 million were awarded during the first 10 months of 1953 for sewage collection and treatment facilities. This includes an estimated $158 million for sewage treatment plants and interceptor sewers involving 549 projects. During the first 10 months of 1952 contracts valued at only $305 million had been awarded and only $362 million were awarded during the entire year. Included in this total were contracts for 515 sewage treatment plant projects valued at $137 million. This shows that there was a substantial increase in the vlaue of contracts awarded for sewage collection and treatment facilities during 1953. Approximately 90 percent of the total construction in this field has been undertaken by municipalities.

During the first 10 months of 1953 construction contracts valued at $241 million were awarded for water supply facilities. This compares to a total of $193 million for the first 10 months of 1952 and a total for the entire year of $227 million. Approximately 90 percent of the total construction in this field was likewise undertaken by municipalities. The figures cited were compiled by the U. S. Department of Commerce and show that there was a substantial increase in the construction of water supply facilities during 1953.

V. E. Eradication

Additional States are setting up semi-monthly inspections of premises where garbage is fed to swine. Such inspections were conducted by 24 states, according to information received by the Department of Agriculture as of January, 1954, compared with 9 states last August. This extension of periodic inspections gives State and Federal authorities a better opportunity of determining the exact location of infection, of determining whether laws and regulations relative to the cooking of garbage and the movement of garbage-fed swine are being complied with, and of giving information and assistance to swine producers concerning these matters. All these measures are important to the control and eradication of V.E. (vesicular examthema). Of the 12,288 garbage-feeding establishments in the country, approximately 45% are now being inspected regularly and 54% are known to be cooking garbage. Other States are preparing to begin periodic inspections.

The States now conducting semi-monthly inspections are as follows: Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Illinois, Iowa, Louisiana, Maryland, Mississippi, Missouri, Montana, Nebraska, Ohio, Oregon, Rhode Island, South Dakota, Tennessee, Utah, Wisconsin and Wyoming.

Laws or regulations requiring proper heat treatment of garbage before feeding to livestock have been passed in 44 states.

• • •

Protecting Maintenance Men

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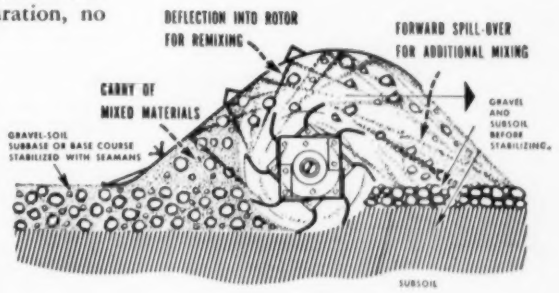
This mechanical stabilization is economically accomplished with the SEAMAN PULVI-MIXER.

Moreover, this processing also *stabilizes movement of the base and sub-base.* If weather action occurs in the sub-base, the movement it causes is wholly uniform and the base course flexes with it.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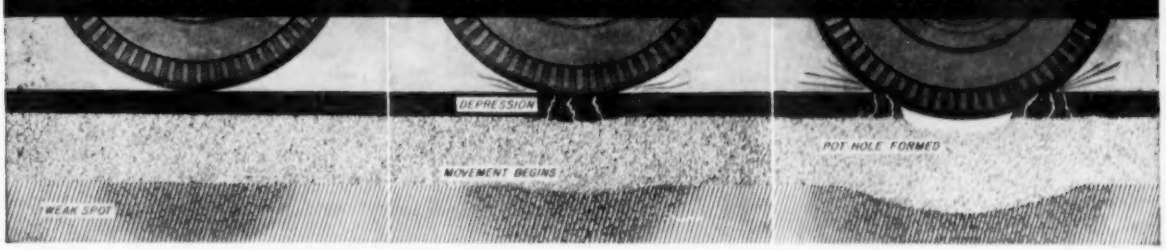

Moisture has entered the unstabilized sub-base causing a weak spot. This would not occur if sub-base had been stabilized to uniformity and high density.

The expansion through freezing or the breakdown of the sub-base through the disintegrating effect of moisture is reflected in a localized movement of the materials above in the base.

Complete breakdown of the base course above the sub-base failure has started a chain reaction as more moisture will permeate the fault and establish repeated breakdown cycles along the width and length of the pavement.

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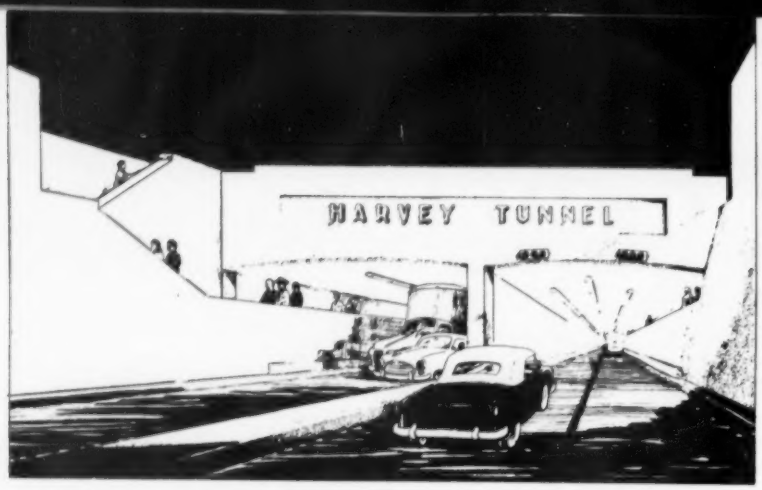


● **HARVEY tunnel has two separated tubes each 22 ft. clear width; length is 1894 ft. The four lanes are constructed as a single integrated box section.**

NEW ENGINEERING IDEAS *FEATURED* IN VEHICULAR TUNNELS

PLANS and specifications for two vehicular tunnels under the Intracoastal Canal in the New Orleans area have been completed by the designers, Palmer and Baker, Inc., consulting engineers and naval architects. Bids for construction of the first of these, the Harvey Tunnel, which will be the South's first underwater four-lane traffic tunnel, were advertised late in 1953.

The companion tunnels are said to represent new engineering departures not only for the South but for the nation. They will be the first completely automatic subaqueous traffic tunnels anywhere in the world. Both will be toll free, and are expected to have a material effect in relieving traffic conditions in the industrial area around New Orleans.

The Harvey Tunnel, estimated to cost $5,500,000, will be built under the Intracoastal Canal at a point eight-tenths of a mile south of the Harvey Locks. The Belle Chasse Tunnel, estimated to cost $2,750,000, will be under the Algiers canal short cut, 9 miles long, running west from the west bank of the Mississippi River to the existing Harvey Canal. The locks at the entrance to the Algiers cutoff have been completed, but the channel is still being dredged.

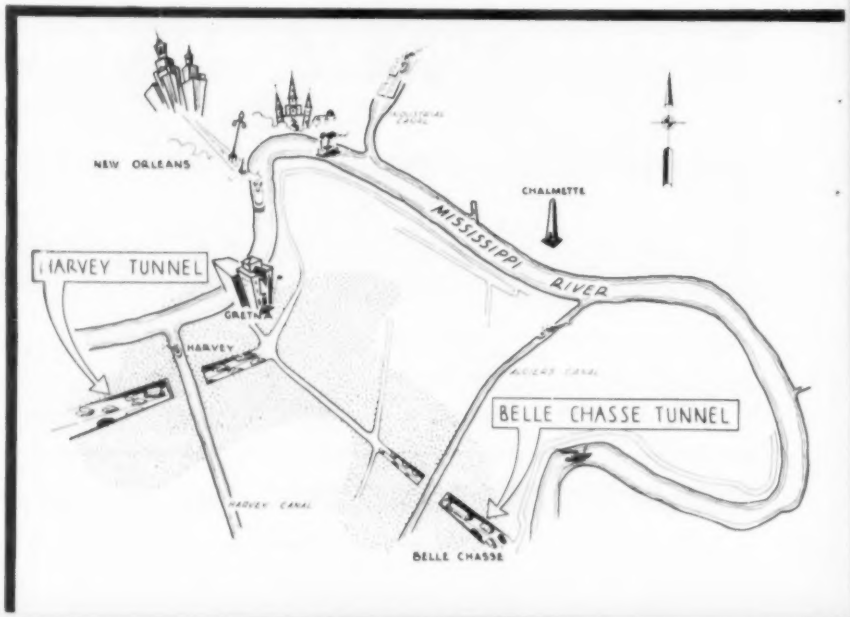
The tunnels, according to the engineers, who will supervise construction, will be among the safest and most complete in the world. Each will have automatic ventilation, pumping and lighting controls. At the entrances to both tunnels the lighting will be graduated so as to condition motorists' eyes to the change from natural light to the artificial tunnel lighting.

In both tunnels, all electrical equipment will be reflected in panel boards at the entrances, with duplicate boards in State police headquarters. The panels will automatically summon maintenance crews in the event of trouble with any of the equipment. All operating equipment is additionally duplicated with extra stand-by equipment that will function while regular equipment is repaired in an emergency.

The larger, four-lane Harvey Tunnel will be a concrete box section with two roadways, each 22 feet between curbs. The tunnel's minimum inside height will be 14 feet, and the exterior top of the tunnel 18 feet from the mean low Gulf water level. It will be 1,080 feet long from portal to portal, and 1,894 feet long from grade point to grade point. In addition to being the South's first four-lane underwater traffic tunnel, the Harvey will be the first in the nation to have four lanes in one integrated box section.

The Belle Chasse Tunnel will have an over-all length of approximately 1,933 feet, with 800 feet of the tunnel, exclusive of approaches, under water. Inside will be a 22-foot concrete roadway, curb to curb. The tunnel roof will be 14 feet above floor level, and the top will be 18 feet below low water level in the canal. Both tunnels are completely safeguarded against flooding. Each, in addition to roadways, will have walkways for pedestrians.

The Harvey Tunnel is planned as an integral part of the expressway along the Mississippi's west bank which will link U. S. Highway 90 with the projected Mississippi River bridge leading into downtown New Orleans. Since water-borne traffic is heavy in the area in which the tunnel will be built, the Intracoastal Canal must be kept open while construction is under way. The contractor will have the choice of floating the center 15,000-ton section into place and sinking it into posi-



● **LOCATION map shows Harvey and Belle Chasse tunnel sites.**

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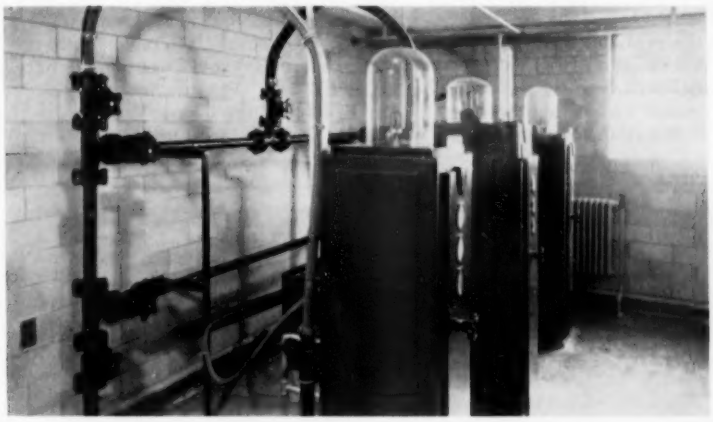

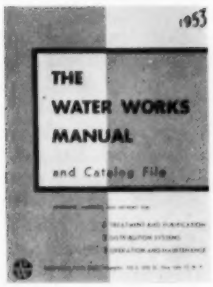

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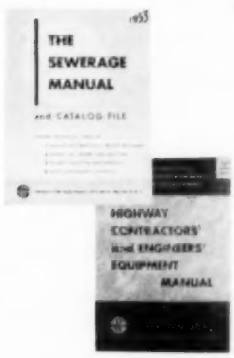

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tion, or of building it "in the dry" by coffer-damming across the Canal in two steps and closing off not more than half the canal at one time.

Since the new cutoff where the Belle Chasse Tunnel will be built is still being dredged, it is planned to build this tunnel on dry land below the level of what is later to be the canal's bed. When the tunnel is finished, the remaining plug of land between the canal and the river end of the canal will be dredged away, allowing canal waters to flow over the top of the underground tunnel. The Belle Chasse Tunnel will form part of Louisiana Highway 31 along the Mississippi's west bank.

In both instances, authorities recognized that the initial costs of tunnel-building are heavier than bridge-building, but in both cases it was decided that maintenance costs would be far less and also that only tunnels could prevent all conflict between water-borne and vehicular traffic. In both Jefferson Parish (where the Harvey Tunnel will be located) and Plaquemines Parish (site of the Belle Chasse) the authorities and business interests were overwhelmingly in favor of tunnels as the solution to traffic problems. Each tunnel is being financed jointly by parish (county) and Federal funds.

Palmer and Baker, Inc., designers of the tunnels, have designed and supervised construction of vehicular tunnels under the Mobile River and the Houston Ship Canal.

• • •

Legal Aspects of Sewerage and Sewage Disposal

THE construction and maintenance of sewers are municipal functions of major importance. Care must be exercised in connection with them or costly damage suits may result. In Information Bulletin No. 160 of the Association of Washington Cities, published at the University of Washington, Seattle 5, Wash., Ernest H. Campbell has submitted an excellent summary covering fifteen closely typewritten pages, with many legal references.

Section headings include: I—Legal nature of relationship of cities and towns to sewers—proprietary functions distinguished from governmental functions; II—Adequacy of sewer for future needs; III—When heavy rainfall constitutes a defense; IV—Liability for defective sewers or obstructions therein; V—Pollution resulting from sewers and abatement of nuisances; VI—Potential liability during construction and maintenance of sewers; VII—Removal of trees clogging sewers; and VIII—Sewer rates, connections and liens for delinquent accounts.

As an illustration of the type of material published, Section VII is presented herewith. The references given are numbered consecutively from Section I, and those appearing in the first six sections are omitted.

Removal of Trees

As a general rule, unless one person has dedicated the property for the entire street, the title to one half of the street is in the abutting owner, the only right which the city and the public have in the street being as easement for travel and for certain utilities thereon. Hence the abutting property owner may beautify his parking strip with trees and shrubs, and acquires an interest in them that the law will protect against anyone who, without lawful authority, injures or destroys them. Nevertheless, the abutting property owner plants trees in the street subject to the rights of the public, and he must make certain that they are maintained on the street park-

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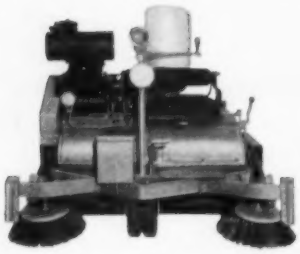

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ing strips so as not to obstruct or impair the free and full use of the sidewalk and street by the public. If a city has knowledge (either actual or constructive) that a tree in a parking strip actually is clogging a sewer, failure to take action with reasonable promptness to remedy the condition may constitute actionable negligence.

The case of *Schaller et al, v. City of Tacoma*[18] involved an action for trespass brought against the city of Tacoma and its Commissioner of Public Works for treble damages for the removal of two poplar trees which stood in front of the plaintiff's property beyond a cement sidewalk, about ten feet from the front line of the plaintiff's property. Approximately 12 or 15 feet away from the trees, there was a sanitary sewer which had been constructed and was being maintained, by the city. The sewer was of standard construction and about seven or eight feet beneath the surface of the ground. During 1913, the sewer became clogged in front of the plaintiff's property, the obstruction being so complete that the city employees were unable to open the sewer in the ordinary way, but were compelled to excavate and to take up sections of the pipe. When this was done, it was discovered that roots from the trees had grown into the sewer and completely obstructed it. In 1917, the sewer again became clogged with roots from the trees. Immediately thereafter the trees were cut down under an order of the Commissioner of Public Works. The trial court dismissed the action, and the judgment of the trial court was affirmed upon appeal. The State Supreme Court held the city was not liable for damages for removing the trees.

In view of the decision in *Shaw v. Yakima*,[19] in which it was indicated that if the plaintiff had filed her claim for damages with the city of Yakima as required by the city charter of Yakima, she probably would have been permitted to recover damages against that city for the removal of a maple tree from the parking strip. Great care must be exercised in removing trees from the parking strip. By reason of failure to comply with the charter provision regarding the filing of claims, this action was dismissed. However, in the light of this decision, it would seem that when removal of trees from parking strips by cities or towns is contemplated, it is desirable practice for the city to obtain, if possible, the consent of the abutting property owner for such removal. If such consent cannot be obtained

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and the city is of the opinion that a tree or shrub is clogging or unduly interfering with a sewer and that the removal of a tree or shrub from the parking strip is necessary, the city should take photographs of such tree or shrub and adduce the other necessary evidence to support removal of a tree prior to the removal thereof so as to be prepared to defend its action in removing the tree or shrub in the event of litigation.

[18]99 Wash. 166, 168 Pac. 1136 (1917).

[19]183 Wash. 200, 48 P. (2d) 630 (1935).

Cathodic Protection for Waste Treatment Plants

CATHODIC protection has proved to be a most useful tool in mitigating the effect of corrosion on sewage and industrial waste treatment installations. Chlorination Topics, published by Wallace & Tiernan Co., listed the following typical installations in a recent issue.

Wastes from fish cannery operations and salt water infiltration provided a highly corrosive potential of sewage handled at the Los Angeles Terminal Island plant. After corrosion had made extensive replacements necessary, all the submerged equipment was placed under cathodic protection by a system designed and furnished by Electro Rust-Proofing.

Similar systems have been installed in sludge blanket type clarifiers treating sewage waste at Daytona Beach, Florida and at Benton, Illinois for treatment of brine water in a Shell Oil Company oil field flooding project. The Linden-Roselle, New Jersey, sewage treatment plant required corrosion control of the steel piling of a salt water loading dock. Electro Rust-Proofing designed a cathodic protection system using a 150-amp rectifier and graphite anodes to maintain the structure at a negative potential of 0.8 to 1 volt when referred to a copper—copper sulphate half cell. Magnesium anodes were provided to protect the soil side of the sheet steel piling. Some 800 feet of air and 2500 feet of water pipe line were protected with magnesium anodes buried in the soil and coupled to the pipe. Another rectifier with graphite anode ground bed was provided to protect 550 feet of 48 inch cast iron pipe buried in a salt water marsh under a reservoir of the Esso Refinery. Heavy bonding straps installed across each pipe joint to provide a continuous bar for the drainage of approximately 15 amperes of protective current.

Corrosion of pipe crossing under treatment structures at the Salinas, California, sewage plant made repair and replacement unusually expensive. Electro Rust-Proofing designed cathodic protection for these pipes using galvanic magnesium anodes to supply the protective current. A Cyclator (Infilco) clarification tank treating white water pulp mill waste at W. C. Hamilton and Sons plant at Miquon, Pennsylvania experienced serious corrosion of the submerged steel mechanism. Here Electro Rust-Proofing designed and installed cathodic protection with a rectifier furnishing protective current with some sections of the structure protected with galvanic magnesium anodes.

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Toll Road Policy of Bureau of Public Roads

The Bureau of Public Roads is authorized by law to extend Federal aid to toll bridges on the Federal aid system; it is not authorized to extend aid to toll roads, and the existing statutes would have to be amended to permit granting aid to

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such roads, according to Commissioner F. V. du Pont. The Bureau is an administrative agency and has no legislative responsibility or authority. It should not be inferred, however, that the Bureau does not recognize that toll roads have a place in the highway picture, he said, as these afford an expedient means of solving specific problems in those areas where the traffic is so great that the cost of creating adequate facilities is either beyond the financial ability of the state to supply, or it is inequitable to expend such amounts in a given area. It is Bureau policy that the sponsoring, construction and operation of toll roads should be delegated to existing state highway departments in preference to the creation of separate authorities.

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Highway Equipment Delays

The largest single source of delay (other than weather) common to all classes of equipment involves the repair and maintenance of the equipment itself. Approximately 30 percent of all delays (average for all jobs, excluding weather) is attributable to this cause. Although costly if carried to extremes, acquisition of new equipment is excellent insurance of dependable mechanical performance and ordinarily will avoid much of the "down" time common to older equipment.

The problem of keeping equipment in satisfactory repair is a critical one. Mistreatment of expensive equipment by careless or inexperienced operators must frequently be condoned by users, simply because of a shortage of capable and conscientious operators. There is a general scarcity, too, of dependable mechanics for servicing and repairing of equipment. These are circumstances which cause highway contractors and engineers to place a higher premium on the long-term ruggedness, durability, and "built-in maintenance" features of heavy equipment rather than on its first cost.

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Motor Fuel Taxes

Five states have recently increased their motor fuel tax rates. California raised its gasoline tax from 4½¢ to 6¢ per gallon, and the rate on Diesel fuel from 4½¢ to 7¢. These California tax rates will be reduced ½¢ per gallon after two years. In Iowa the gasoline tax was increased from 4 to 5¢ per gallon, and the use fuel tax from 4 to 6¢ per gallon. In Maryland and Nebraska, the increase was from 5 to 6¢ per gallon; and Ohio from 4 to 5¢.

Colorado and Nevada made previously temporary 2¢ and 1½¢ gasoline tax increases permanent. Pennsylvania extended its temporary 2¢ motor fuel tax for an additional two-year period as did Oklahoma with its 1¢ levy. In South Carolina extension of 1¢ of the gasoline tax scheduled to expire June 30, 1954 was approved, thereby making the present 7¢ rate effective until June 30, 1958.

Twenty-eight states have approved measures memorializing Congress to withdraw the Federal Government from the field of motor fuel excise taxes. Tennessee also asks repeal of all automotive excise taxes. California memorialized Congress either to withdraw from the field of motor fuel taxation or to earmark the Federal tax for expenditure in the states, for highway purposes, according to the amount of Federal tax collected in each state.

Florida and Utah have asked that the pro rata share of Federal gas tax revenue be returned to the states until they are given the right to substitute their levies for Federal excises.

Two states, Kansas and New Hampshire, have enacted gasoline tax increases to become effective when and if the Federal gasoline tax should be repealed. — From Highway Users Conference.

Two Men and a Backhoe Digger Install Water Services Fast

SPECIALISTS in working for water departments is the term pinned on Fred A. Remick and Cecil K. Howle who, some seven years ago organized the Utility Installation Co. They decided to go into the business of digging trenches for the service pipes from water mains into dwellings; and also to dig septic tank holes and disposal lines; and wells. They bought a Sherman hydraulic backhoe type digger and started in. During the early days they dug most any kind of a hole. One day they got the job of trenching for water services in Southfield Township, in the northwest environs of Detroit. It was a tough job. They had to work in a mud so thick and sticky that they used a bulldozer to move the trencher from one job to another.

From that day on they became specialists in working for water districts. Now they have two Sherman diggers, but so successful have been their operations that both the partners and their crews of from two to six men are busy all of the time. This kind of work requires a machine that is fast and flexible, and is compact and easily handled. A 2-man crew has installed as many as 20 services in one day; with six men and the two diggers the rate of work is correspondingly higher. Utility Installation Co. has found it can keep busy all year around, even when the ground is frozen to a depth of 6 ins.

● **INSTALLING** water services fast with a Sherman digger.

PUBLIC WORKS DIGESTS

THE SEWERAGE AND REFUSE DIGEST

An Unusual Waste Treatment Plant

There is being constructed at Delano, Minn. a waste treatment plant which embodies five features not in common use. 1—Preaeration under pressure. 2—Short-term primary settling based upon 2,000 gal. per sq. ft. rise. 3—The use of an equalization-of-flow or dilution tank. 4—The return of recirculation liquor from the race of the final Spiraflo type settling tank. 5—The chemical treatment of sludge.

Preaeration is effected in a tank inserted in the discharge line of the raw sewage pump, where it is placed under a pressure of 20± psi, which will increase the solubility of the oxygen sufficiently to satisfy all of the immediate (chemical) demand of the sewage. Short-term primary settling prevents septic conditions. The design of the equalization-of-flow tank is based upon the holding of treated or aerated liquor rather than raw sewage. The Spiraflo tank provides a long flow distance through the annular race at low velocity without contact with the settled sludge; from which race the recirculation liquor is withdrawn. Ferric chloride is added to the sludge at about 2,000 ppm to produce a pH of about 3.5 with practical sterility. The filter bed is filled with a tile medium, with aero-filter type of distribution.

"A Waste Treatment Designed for 100% Aerobic Treatment. By J. A. Lindsey and R. L. Smith. *PUBLIC WORKS*, February.

Detergents and Biological Oxidation

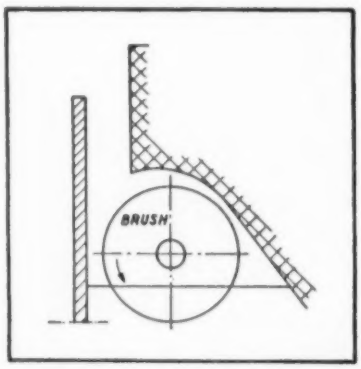
Experiments to learn the effect of detergents on biological oxidation of sewage were conducted at the sewage works of the Halifax sewage works and reported by the manager to the Institute of Sewage Purification, England, in November, 1953. As J. Hurley had shown that the sodium alkyl sulphates had no material effect on the oxidation of sewage at concentrations likely to be encountered, the experiments were confined to sodium alkyl-aryl sulphonates and non-ionic ethylene oxide condensates in percolating filters and activated sludge treatment. It was concluded that interference with biological oxidation is imminent only with the stronger sewages resulting from low water consumption, or wash days, or other peak discharges. Also the effects on sedimentation, acid precipitation, and sludge digestion and drying were not studied. Both types of detergents caused foaming of purified effluents. Activated sludge was permanently inactivated to some extent by the alkyl-aryl sulphonates. The deterioration in the degree of treatment increased sharply when the proportion of detergents as active matter increased above 20 ppm in crude sewage.

"Detergents and Their Effect on Biological Oxidation." *The Surveyor* (England), December 19.

Heat Pump for Heating Digesters

In localities where the cost of electrical energy is less than $0.01 per kwh, the heat pump may be a more economical means of digester heating than by oil. Where considerable amount of gas is generated, all of it could be used in a gas-electric generator, and the major portion of digester heat salvaged from the exhaust gas and engine cooling by means of the heat pump, which also could absorb any additional heat necessary from the incoming sewage. At present, the application of the heat pump in sewage treatment plants appears to be more or less limited to the small plant producing too small an amount of gas to be utilized economically; or to a plant of such size that the gas can be used to generate the electrical energy needed in the plant, with perhaps an excess for sale during periods when more can be generated than is needed; thus avoiding the problem of gas storage.

"Use of the Heat Pump for Digester Heating." By George S. Smith, Prof. of Electrical Eng., and James A. Morris, Jr., Bell Laboratories. *Sewage and Industrial Wastes*, December.



Courtesy Sewage & Industrial Wastes

● BAFFLE used in brush test.

Brush Aeration Of Sewage

In aeration by means of a rotating brush, the natural surface of the water ripples and surges, drops of water are thrown into the air, air bubbles are introduced into the mass of water, and the agitation of the water produces foam around the body of the brush, which foam may represent a large surface of water in a small space. Oxygenation produced by rippling and surging is slight. The mass of the drops of water churned up is slight. The effect produced by the air bubbles which are carried along in the water can only be slight. The foaming in the immediate vicinity of the brush is responsible for most of the oxygenation that occurs. It follows that the aeration of water in a small tank proceeds just as well as in a

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large one. Testing two tanks, one of 936 cu. ft. volume, the other of 141 cu. ft., it was found that roughly 10% per net kwh more oxygen is absorbed by the water in the smaller tank than in the larger one, due to the greater turbulence in the smaller tank. Expressed in grams per hour per cubic meter, the rate of oxygenation was actually 6 to 8 times as high as in the large tank. It was further found that, by fitting a baffle around the brush, 25% more oxygen is introduced into the water per kwh. Incidentally, the baffle prevents any trouble due to ice formation on or around the brush.

"Research on Activated Sludge: Experiments with Brush Aeration." By A. Pasveer, Nat'l Health Research Council, Netherlands. *Sewage and Industrial Wastes*, December.

Activated Sludge Treatment of Radioactive Waste

Laundry wastes at AEC installations usually contain a rather low concentration of radioactive materials, such that 80 or 90% removal is adequate. Tests at Los Alamos indicated that such removal from a mixture of 15% radioactive waste and 85% settled sewage were possible by the activated sludge process including long aeration periods and filtration of effluents. It was found that concentration of plutonium in the zoogleal sludge was high, even when low in the raw feed, showing tnat zoogleal sludge is an effective concentrator of plutonium, and all excess sludge from a plant would require special handling and disposal.

"Activated Sludge Treatment of Radioactive Laundry Waste." By Leo M. Reading, Everett R. Mathews, C. W. Christenson and J. F. Newell. U. S. Atomic Energy Com'n. *Sewage and Industrial Wastes*, December.

Treating Vegetable Processing Wastes

To compare three types of treatment of wastes from a plant processing beets, corn, beans, potatoes and spinach at Seabrook Farms, Bridgeton, N. J., the company, in June 1949, began operating three pilot plants running simultaneously to treat identical wastes which had first passed through a fine 20 x 30-mesh screen. The methods used were: 1—Chemical coagulation with lime, alum and chlorine. 2—A deep high-capacity biofilter. 3—A high-rate biofilter. The BOD of the effluent from the first was in excess of that required by the State Dept. of Health. The BOD of the effluent from the second was satisfactory only with loadings as high as 12,000 to 17,000 lb. of BOD per acre-foot per day, which exceeds that recommended by the Dept. of Health. The high-rate biofilter would be the most economical and produce a satisfactory effluent; would be more flexible to handle the varying loads produced by the wastes from the processing plant. The maximum loadings would be 5,000 lb. of BOD per acre-foot per day.

"Pilot-Plant Studies on Treatment of Vegetable Processing Wastes." By R. A. Webster, Supt. *Sewage and Industrial Wastes*, December.

Cyanides In Sewage

The chlorine requirement of a sewage is, in many cases, greatly increased by the presence of ferrous iron, cyanides and other industrial wastes. At Detroit, Mich., during 1952, approximately 7% of all influent sewage samples tested showed chlorine demands in excess of 10 ppm, although demands of normal

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flow averaged less than 5 ppm. Ferrous iron accounted for 80% of this, cyanide for 15.2%. Slugs of cyanide have been found in concentrations as high as 25 ppm. Chlorine demand is increased 2.73 ppm per part of cyanide. Stream control standards prohibit the discharge of cyanide into receiving waters except for minimal concentrations. "Cyanides" include both simple cyanide, and also cyanide complexes, which are potential sources of simple cyanides. The authors offer a definition of cyanides and a laboratory method for determining them.

"Occurrence and Analysis of Cyanides in Sewage." By Lawrence A. Meyerson and Peter Skupeko, Chemists, Detroit Sew. Treat. plant. *Wastes Engineering*, January.

Pittsburgh Project Plans Completed

Plans for treating the sewage of Pittsburgh, Pa. and 63 other municipalities have been completed by the Allegheny County Sanitary Authority and are in the hands of the Pennsylvania Dept. of Health for review and approval. Most of the features of the project have already been described in the technical press. They include a number of unusual features in both the treatment method and the construction of the intercepting sewer. The former provides for 50% removal of BOD from 150 mgd. Raw sludge will be preheated to 95° and concentrated for 5 days and then incinerated, with coal slack used as fuel, possibly mixed with the sludge.

Of the 63.5 miles of intercepting sewers, 32 miles will be in deep tunnel, requiring drop manholes from 20 to 150 ft. deep. Studies were made which resulted in plans for discharging sewage into the drop manholes spirally to reduce the vertical velocity, and for venting the air drawn into the tunnel with the sewage. The intercepting sewer will discharge into a wet well at the pumping station, where the sewage will stand as much as 74 ft. deep, but will be pumped down once a week to produce temporarily a velocity in the sewer sufficient to remove any grit settled therein.

"Pittsburgh Plans Unique Project to Abate Stream Pollution." By John F. Laboon, Chf. Engr. *Civil Engineering*, January.

Flocculation of Sewage Effluents

Mechanical flocculation of sewage effluents has been practiced in the

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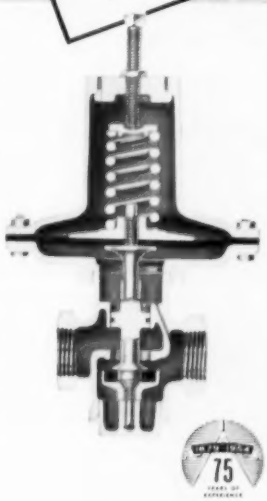

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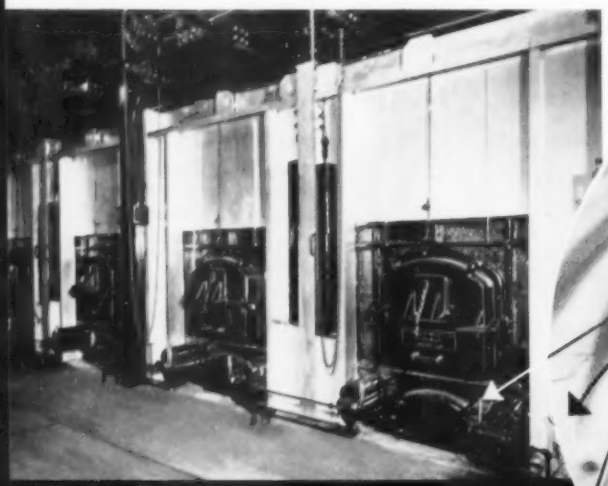

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United States and Holland, but there has been little published information concerning its performance. Experiments made in England with a Dorr laboratory flocculator indicated that flocculation of a filter effluent followed by 15 to 30 min. of quiescent settlement produced effluents of about the same quality as those from humus tanks. Large-scale experiments are being conducted at Wolverhampton's main sewage works.

"Mechanical Flocculation in Sewage Treatment." By John Hurley. *Municipal Engineering* (England), January 8.

Plant to Produce A Polished Effluent

Bracknell, England, discharges the effluent from its treatment plant into a stream with very little summer flow. Therefore a plant was designed and is under construction to produce an effluent with a BOD of not greater than 20 ppm and not more than 10 ppm suspended solids. It consists of grit channels; comminutors; primary settling tanks; percolating filters; two humus tanks, one a Dorr Clariflocculator, the sludge from which is pumped back to the primary settling tanks. The effluent is "polished" by passing through micro-strainers. Two of these are included in the initial installation, with room provided for four more. Each strainer is 7 ft. 6 in. in diameter by 5 ft. long, fitted with fabric of 35 microns, 75,000 apertures per sq. in., which should treat between 1.0 and 1.5 mgd. Provision has been made for taking to the recirculation wet well effluent either before or after the humus tanks. Primary sludge will discharge to one of two thickening wells, each with a capacity of one day's sludge. Four digestion tanks are provided, two primary with a capacity of 1.5 cu. ft. per capita, and two secondary with 1.25 cu. ft. per capita. Drying beds have an area of one sq. yd. for each 4.36 persons.

"Design of Sewage Treatment Works for Bracknell New Town." By R. E. Bartlett. *The Surveyor*, Jan. 16.

Distributors for Subsoil Filters

The Maine State Division of Sanitary Engineering has developed a system of subsoil absorption trenches for use in disposal of septic tank effluents at isolated public schools, camps, etc. Percolation tests are made to determine the length of trench, following standard practice. In a typical installation, a trench is dug 3 ft. wide and 3 ft. deep. In this is placed a foot depth of bank gravel of ¼-in. to 6-in. size. On this is placed a distributor consisting of a trough of 12-in. hemlock plank, inverted and nailed to a hemlock board of the same length. In the edges of the trough, before nailing to the board, are cut V-shaped notches 2 in. wide and deep at 12-in. intervals. The triangular conduit thus formed is placed, with the board as the bottom, on top of the gravel, graded to a fall of 1 in. per 100 ft. The trench is then backfilled with a foot of gravel or crushed rock, 2 to 3 in. in size. On this is generally placed a layer of building or roofing paper, and the top foot backfilled with run-of-bank coarse gravel. Experience in Maine with hemlock as "mud sills" indicated that such wood, if kept wet in contact with the ground, would last scores of years.

"Subsoil Sewage Disposal System for Septic Tank Effluents." By E. W. Campbell, Maine State Sanitary Engineer. *PUBLIC WORKS*, February.

OTHER ARTICLES

"Treatment of Tannery Wastes and Domestic Sewage at Fond du Lac, Wis." by flocculators, clarifiers, filters and digesters. By Bruno J. Hartman, Sewage and Industrial Wastes, December.

"Proposed Toxicity Test for Industrial Wastes," using a standard species of fish. By Alfred W. Anderson. Sewage and Industrial Wastes, December.

"Industrial Wastes Inventory." Tabulated data, classified by industries and by states. Engineering News-Record, Jan. 14.

"High-Speed Sewage Treatment" for treating brewery wastes and municipal sewage, with aeration, sedimentation, and thermophilic digestion. American City, January.

"Biological Sewage Treatment, Highlights in the History of." By Karl Imhoff. Water & Sewage Works, January.

Sludge digestion at five plants at Birmingham, England, described in detail. "Sludge Digestion at the Works of the Birmingham Tame and Rea District Drainage Board." By C. H. Hewitt. Contractors Record (England), January 13.

• • •

Marking Highway Equipment for Safety

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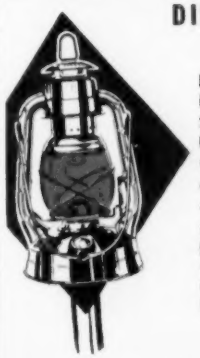

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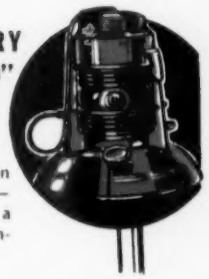

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Advice to the Operator:

How to Get The Most From Your Sludge Drying Beds

Many cities still use the old-fashioned method of sludge disposal by putting it onto beds to dry. The "Digester" of the Illinois Sanitary Engineering Division has some good advice and information for operators of sewage treatment plants who must use sludge drying beds. It says:

To get the most out of your drying beds you can do one of three things: (1) Run different depths on the bed and check on how long each takes to dry, (2) Check your solids content and draw to a depth where that type of sludge dries the best, and (3) Draw to some convenient depth between eight and twelve inches and pray for good weather.

The first method is simple. By experience with the kind of sludge you have, you can draw, say five inches, if it is real thick, or twelve inches if it is thin. The second method calls for a little testing equipment to weigh a measured amount of sludge before and after drying in an oven or under a heat lamp. Percent moisture or solids can be figured from the test.

In the third method you just draw sludge—that is the method most operators use, but before you get too sloppy in your work let's see what can be done with a little more care.

Sludges Are Different

The raw sludge in the hopper of the primary tank may have anywhere from one percent to five percent solids. When we talk of percent solids we mean on a "dry" basis. If we took all the moisture out of 100 pounds of a one percent digester sludge, the weight of the entirely dry solids would be one pound—one pound of "dry" solids in 100 pounds of wet sludge is a one percent sludge. Secondary tank sludge is somewhat thinner. In the Imhoff tank after several months storage, solids may build up to fifteen percent (that's really thick), but in the separate digester it may be five to twelve percent. There is no sameness about sludge.

The depth of sludge drawn will depend on the amount of solids. Two beds of sludge at, say 8% solids (92% moisture), drawn to a depth of 8 inches on one bed, and 10 inches on another will dry in different times. The 8-inch bed will dry in about two weeks, but the 10-inch will take about three weeks. In this case you draw 25% more sludge but it takes 33% more time.

Your sludge may be, and probably is, different. Whether you draw 8 inches, 10 inches, or 12 inches will depend on what results you get and whether you need the space right away. Operators may get six to ten drawings of sludge dried per year for each bed. Drying periods may range from ten days to a month.

About ten months of the year can be used for sludge drying in Illinois, but it is during the warm, dry summer months that you can get the most work from your drying beds. If your sludge does not dry fast enough, try the alum treatment.

Alum is the commercial alum used in water treatment. How much is needed depends on the sludge.

Pekrul Gates

All sluice gates installed in the **United States Steel Corporation's** huge, new Fairless Works, Fairless Hills, Pa., were designed and manufactured by PEKRUL. Shown here are several gates among approximately 200 PEKRUL gates installed in pump stations and sedimentation basins.

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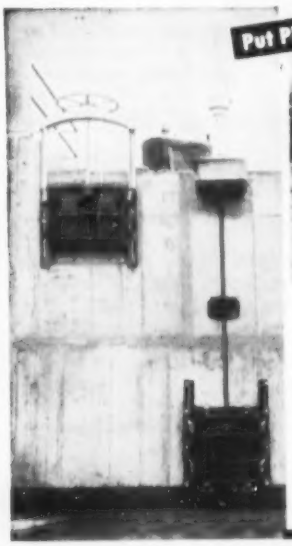

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As a starting point, use a pound or two of alum for each cubic yard of sludge. If you draw a bed that takes about 20 cubic yards, use 20 lbs. of alum. Dissolve the alum in water and feed this solution to the sludge as it discharges from the pipe at the inlet of the bed. The method does not require any equipment that you can't get locally.

It seems that alum-treated sludges float on the separating water, causing the water to drain rapidly. If all goes well the sludge should drain in 24 hours, crack in four days, and dry in ten days. In other words alum may cut down the drying time by nearly one-half. Try it if you are stuck for sludge bed area, but plan for more sludge beds too.

Removing Sludge From Beds

A few large plants have mechanical elevators, conveyor belts, and loaders, but nearly all operators have to use hand tools to lift the sludge from the sand surface. One of the best hand tools is a shovel-like fork having several tines, or long teeth, an inch so apart, called an ensilage fork. A coal or stone fork is similar and can also be used. Very little sand is picked up by the fork; the biggest loss of sand is that which hangs to the bottom of the sludge cake.

Many small plant operators use wheelbarrows to haul the sludge from the bed. Planks are laid on the bed for a runway. Wheelbarrows can be placed close to the worker so that the shoveling distance is not great. More and more plants use pick-up trucks, or dual-wheeled dump trucks. The dump truck is one of the best because it can be unloaded quickly and most municipalities have them for other purposes anyway.

Where trucks are used it is good if the beds are not so wide that the operator has to walk several steps to throw a fork-full in the truck body. Usually, the operator needs additional help when sludge beds are unloaded. Truck wheels will damage the bed if driven directly onto the sand, therefore, concrete treadways should be built through the center of the bed, with treads wide enough to carry dual wheels, or heavy planks must be placed on the sand after sludge has been removed.

The crawler tractor with side bins is very popular in larger plants because it can operate on any shape or size beds without treadways.

After sludge has been removed, the bed should be prepared for the next drawing. This may be the time to replace sand lost by previous removals. Usually the operator replaces sand on half of his sludge beds, or on one-third of the beds each year. About an inch of sand is lost each year. Any clean sand that is not too fine is satisfactory. If you do not plan to use the bed for some time, don't let it grow up in weeds!

Sludge may be allowed to remain on the beds for several months, if you don't need the space. This practice cuts down on the labor needed to remove the sludge, but it is unsightly and you may find yourself with a tomato garden, for tomato seeds are not hurt by digestion. Here is another "don't." Don't let the tomatoes take over!

After removing sludge from the bed, you can't kick it around until it gets lost; you must find a place for it. In some localities there is a demand for sludge by farmers or others who will drive in and remove it from the beds. If you value your beds, either you will help load it, or you will supervise the work. Too many drying beds have been damaged by willing but careless sludge haulers.

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THE HIGHWAY AND AIRPORT DIGEST

Soil-Cement Base On a Sandy Soil

The Wisconsin Highway Dept. in 1953 let contracts for 289,000 sq. yd. of 6-in. soil-cement base on a 21.5-mile relocation of part of state highway 54. This had been cleared and graded the year before and a 7-in. layer of sand placed on the compacted subgrade, which sand was used as the soil in the soil-cement base. All of the hauling and constructing equipment was mounted on crawler tracks because of the loose sandy soil. This disadvantage was offset by the fact that it was unnecessary to pulverize the soil. Bulk cement was deposited on the road in 4½ ft. windrows at a rate to give 10 to 11% of cement. The mixing train consisted of a tractor-pulled water tank followed by a tractor-pulled mixer, and the mixture was spread by blades to a width of 11 ft. and depth of 8½ in., which was compacted to 6 in. Because of the sandy soil, sheepsfoot rollers were not used for compacting, but a track-type tractor was routed back and forth immediately behind the mixer, followed by a small pneumatically tired tractor. Then the surface was shaped with a road grader, smoothed with a steel broom drag, and finally compacted with a 13-wheel rubber tired roller.

"Soil-Cement Base Solves Wisconsin Road Problem." *Engineering News-Record*, Jan. 14.

Virginia Revising Speed Zones

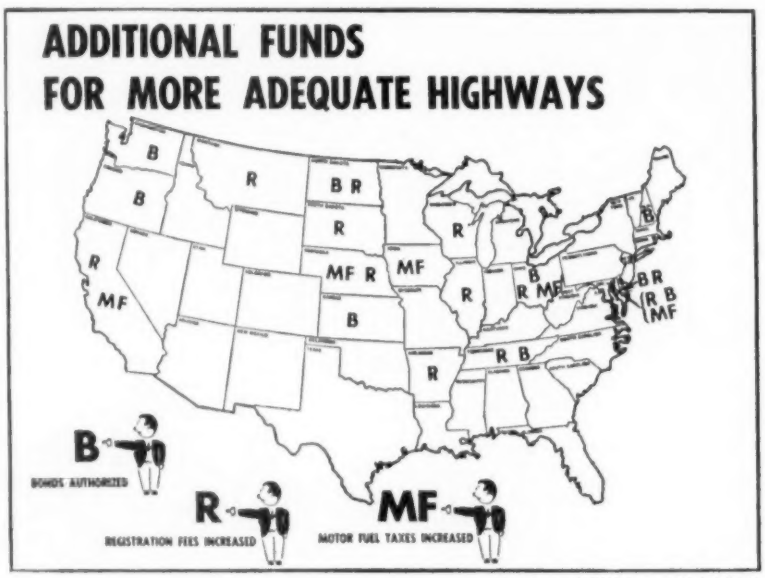
Virginia's Dept. of Highways believes that the speed limits designated by many highway signs are unreasonable. Some setting limits of 25 or 30 mph in sparsely populated districts were established 20 or 25 yr. ago. The usual rural limit is 55 mph (reduced to 25 and 15 mph in business districts, school zones, etc.) and state law requires that no speeds below this shall be established until after a study of conditions by the state highway department. Studies have already been made at over 200 locations.

These studies include securing the speed of all vehicles—at least 200 if possible—passing the station dur- a 24-hr. period. From these data is determined the speed below which 85% of the vehicles were traveling; also the speed range within which most of the vehicles were traveling, and the median speed. In making a recommendation for the speed limit for a given zone, there are considered also the design speed, extent and type of marginal development, overall sufficiency rating of the control section in which the zone is located, accident rates during the previous two years, prevailing speeds of vehicles, and suggestions of the State Police with regard to enforcement. Report is made also of signs that should be replaced or reconditioned, and the need for new signs or pavement messages. Every effort is made to set the speed limit high enough to include the 85 percentile speed. In several instances, speed studies made at the same stations three or four weeks after the speed limit had been raised showed little recognizable difference from the speeds obtained previously; in most instances the speeds were slightly lower, probably because most drivers are more willing to abide by what they consider an understandable regulation.

"Virginia Re-Examines Its Speed Zones." By Herbert R. Perkinson, Jr. Assoc. Traffic & Planning Engr. *PUBLIC WORKS*, February.

Evaluation of Air-Entraining Admixtures

The term *admixture* is generally understood to cover those materials which are added to the concrete either prior to or during the mixing operation. At least 19 manufacturers offer materials with air entraining properties for use as admixture. The Bureau of Public Roads, finding very few data upon which to



Courtesy of "Highway Highlights".

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appraise these materials, has undertaken an investigation to determine their acceptability for use in producing air-entrained concrete for highway pavements and bridges. The 19 manufacturers known to produce such materials submitted 27 samples, which were evaluated to determine their ability to entrain air and their effect on flexural and compressive strength and on durability. Of these, 26 were classified as acceptable; the 27th was not in a form suitable for use as an admixture. Acceptability was based on its substantial improvement in ability to resist freezing and thawing, and that it shall not reduce the strength of the concrete by more than 12%. The materials tested were of seven classes: 7 were salts of wood resins; 7 were synthetic detergents; 4 were salts of sulfonated lignin; 2 were salts of petroleum acids; 2 were salts of proteinaceous materials; 4 were fatty and resinous acids and their salts; and 1 was organic salt of sulfonated hydrocarbon.

"Evaluation of Air-Entraining Admixtures for Concrete." By Frank H. Jackson and Albert G. Timms, engineers of B.P.R. *Public Roads*, February.

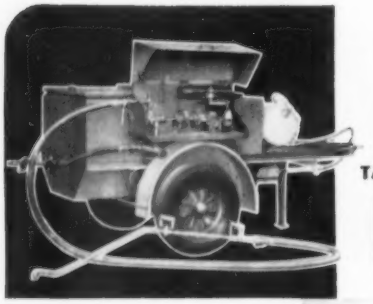
Accidents on German Motorways

The secretary of the German Road Research Ass'n., in a recent paper, compared the accident rates on the motorways (Autobahnen) with those on the state and county highways. A 34-mile stretch of motor road and State Road No. 3 near Hanover both have the same traffic density, and the same traffic makeup: 13% motorcycles, 55% cars, and 32% trucks. Between July 1, 1951 and June 30, 1952, the number of accidents per kilometer on the motor road was 1.94 and on the State road, 4.66, and the deaths were 0.09 and 0.15 respectively. Recent regulations for the motor roads forbid trucks traveling less than 25 mph, or parking except on a "lay-by." The average speed of fast cars on these roads is about 70 mph, but they were designed for 100 mph. They were not designed for the number and weight of trucks that now use them. The axle load allowed in 1934 was 7.4 metric tons, but this was increased in 1951 to 10.0 metric tons (11 short tons). In 1938 only 6.5% of the traffic was heavy trucks; in 1953 the figure was 11.6%, and they travel at speeds up to 50 mph.

"German Motorways After 15 Years' Service." *Highways and Bridges*, Dec. 30.

Constructing Pedestrian Crossings

Methods of constructing crossings of alternate stripes of white concrete and black asphalt, to provide better resistance to wear and less maintenance charges than do surface markings, are described by the English Road Research Laboratory. Two general methods are: 1—Casting white concrete stripes *in situ* in wooden forms; then asphalt stripes laid between, covered with precoated chippings rolled in with hand rollers. The concrete was mixed 1 part white cement, 1¼ parts fine calcined flint, 1¾ parts of ⅜ to 3/16 in. calcined flint, 0.4 water-cement ratio; also calcium chloride to provide early setting, and titanium oxide equal to 5% of the cement to enhance the whiteness. 2—Striper formed with precast concrete blocks 4 in. thick and 12 in. square, the white blocks troweled smooth, the black ones given a rough exposed-aggregate finish. The first method



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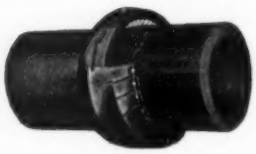

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"Concrete Markings for Pedestrian Crossings." By C. H. Peters and E. Francis. *The Surveyor*, January 9.

Soil-Cement Investigation in England

The Road Research Laboratory (England) is investigating the practicability of constructing soil-cement roads of a thickness less than that of granular base roads. Laboratory experiments showed that a pavement incorporating a soil-cement layer behaves as a flexible pavement, and that soil-cement usually has a flexural strength at seven days of 30 to 40 lb. per sq. in. This is insufficient to prevent cracking; but the cracks will be fine and so closely spaced as to have little effect on the stability of the stabilized layer, if the compressive strength does not exceed 250 lb. per sq. in. If the strength exceeds this, the cracks would be wider and further apart, with less adequate interlocking. The soil-cement should be covered with an impervious surface to prevent softening by water.

"Recent Progress in Soil-Cement for Road Construction." *The Surveyor*, Jan. 3.

OTHER ARTICLES

"Detroit Pushes Expressway System Through Congested Urban Area." By H. C. Coons, Chf. Engr., Mich. State Highway Dept. Civil Engineering, January.

Snow Fences in Great Britain. Discussion and recommendations by Road Research Laboratory. "How to Use Fences to Prevent Roads Being Blocked by Snow." Roads and Road Construction (England), January.

"Equipment for Testing Laboratories." Advice by Road Research Laboratory, England, on what to use in road laboratories, both central and mobile. Roads and Road Construction, January.

• • •

Ohio Procedure for Establishing An Urban Arterial Highway System

How does a city start from scratch to develop an urban arterial highway system with State and Federal-aid? The first need is to know where the traffic both from without and from within the city wishes to go. To determine this it is necessary to make an origin and destination (O & D) survey. For the larger cities, both an internal and an external O & D survey are necessary. For the smaller cities, usually an exterior survey is needed. Costs of such internal surveys are borne 25% by the city, 25% by the State and 50% by the Federal government; for external surveys, no local participation is required. Counties often participate in the cost of internal O & D surveys, particularly where satellite communities are involved or metropolitan conditions exist. State forces make the traffic surveys and analysis which may take from 6 to 12 months to complete.

After the results of the traffic survey are known and summaries are available, the next step is for the city and/or county to hire a consulting engineer to prepare an engineering report to establish a system of arterial highways. Such highways need not be freeways entirely; as a matter of fact the recommendations for the larger cities should base the decisions on the need for the various projects in order to solve the city's traffic problems. This report, after analyzing all needs must recommend a priority program of construction, with economic justifications of the construction of each project, and an estimate of cost thereof.

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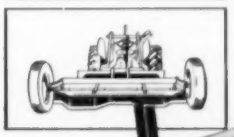

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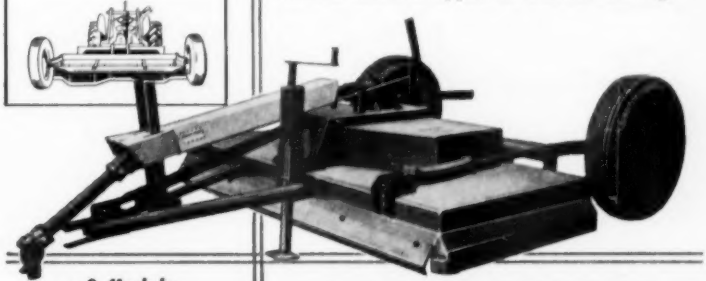

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These engineering reports are a necessity in order to determine a program of construction projects that will fit together and eventually make a complete and well planned system of city routes. Such reports are subject to review and approval by Federal and State engineers before Federal-aid urban funds can be used in the community. These Federal-aid urban funds are intended to provide high-type facilities and are not eligible for so-called street resurfacing projects and projects resulting in little or no increased traffic capacity. Once such a report is approved by all parties, it becomes the fixed program for use of Federal-aid urban funds, and the priority can be changed only by showing of changed conditions indicating need for alterations.

Some cities, even before the ink is dry on such reports, want to substitute a lower priority project or even a project not mentioned in the report. Obviously, there is little chance to get the use of Federal-aid urban funds on such a project.

Consulting engineers are hired by the cities to make such arterial highway reports, sometimes with county co-operation, providing the counties do not have an engineering force of their own capable of undertaking the job, since the State has no authority to hire engineers for city work.

Abstracted from a paper by John J. Heier, the Ohio Highway Department's Deputy Director in charge of Planning and Programming, before the Municipal League at Western Reserve University, in Cleveland.

• • •

Planning Officials Question the Legality of Advertising on Parking Meters

Cities are studying the legal objections being raised which question the use of advertising on parking meters. According to the American Society of Planning Officials, courts have generally upheld the use of parking meters solely on the basis of their use as a means of regulating traffic. The revenue derived from such meters is a secondary matter. Advertising on meters does not contribute to the primary function of regulating traffic. Another objection is that placing advertising on parking meters may convert them, in the eyes of the law, from a "governmental" function of the city to a "proprietary" one.

City attorneys in Columbus, Los Angeles, and San Francisco have

ruled that the proposed placement of advertising on parking meters is unlawful. Minnesota's state attorney general and the legal consultant for the association of Washington cities have indicated that municipalities have no authority to rent space on parking meters.

Similarly, federal law expressly prohibits parking-meter advertising, as well as any commercial signs, posters, billboards, or other private installations, within the right-of-way limits of federal-aid roads. As a result, cities are not allowed to place private advertising on parking meters installed along streets which are part of the federal-aid system.

Most of the cities with revenue from parking meter advertising turn it over to the general fund. Some make special use of these funds. Several cities use the money for parking-meter maintenance, the purchase of municipal parking lots, or for other traffic-control purposes.

From The Police Chief via Highway Research Abstracts

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How Counties Handle Roadside Cleanup

DATA on cleaning of county highways and roadsides and the operation of sanitary fills are available from a second installment of questionnaires from nearly 500 counties throughout the nation. This report supplements the information in the February issue and provides data from about 900 counties.

In highway sweeping, Los Angeles Co., Calif., with 25 power sweepers, leads the list, but some 25 other counties also report more or less highway sweeping. Ventura Co., Calif. uses an Austin-Western sweeper. Oakland, Co., Mich., uses a Wayne sweeper for cleaning 20 miles of gutters; and Ramsey Co., Minn. uses a Rosco sweeper. Most of the other 25 counties merely report in such terms as "power brooms", "power sweepers", and "rotary brooms."

The question "What equipment do you use to keep roadsides clean of trash?" was answered by 107 counties. None of the answers seems to indicate that any satisfactory solution to this problem has been found. No less than 78 of the reports were, in essence, "hand labor and trucks." One reported the most effective means was "arrest warrants." One places trash barrels; others report using Athey loaders, scoopmobiles, Hough loaders, belt loaders and trucks and endloaders.

Another question was: "Do you operate sanitary fills or dumps for handling refuse from people living outside of areas where refuse is regularly collected?" Maricopa Co., Arizona, reports it has just initiated a sanitary landfill but it is not yet in full operation. Amador, Monterey, San Bernardino, San Diego, Sonoma and Ventura counties in California all report operating such facilities. Monterey Co. has 5; San Diego Co. one fill and 22 dumps; and Ventura Co. 9 fills or dumps. Clarke Co., Ga. reports a landfill in operation; and so does Du Page Co., Ill., Alpena Co., Mich. says that the townships take this responsibility. Sanilac Co., Mich. has one installation. Other counties reporting these facilities include Lincoln Co., Nebr.; Deschutes Co., Ore., Box Elder Co., Utah; Henrico Co., Va.; and Roanoke Co., Va. Grays Harbor Co., Wash., has two dumps. In Thurston Co., Wash., old gravel pits are operated by the Health Department as landfills; and in Kitsap Co., Wash., the fill is privately operated under supervision of the County Health Department. Jefferson, Douglas and Chelan counties, all in Washington, report operation of such fills.

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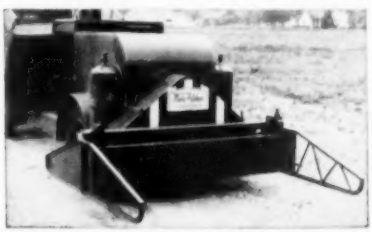

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Controlling Regional Development

JOSEPH F. BASE,
City Manager, Santa Clara, Calif.

A portion of a talk by Mr. Base at a recent meeting of the Bay Area Chapter of the American Society of Public Administration. He was a member of the panel "The Bay Area-One Community-Many Governments." Other members of the panel were Prof. Albert Lapawsky, George Dugger, E. Robert Stallings and Prof. Hubert Marshall.

IT is a challenge to the civic, commercial, industrial, and governmental leaders in the Bay area to adopt and carry out a program of development and control on a regional basis to embody those over-all functions and activities which are common to all of the individual jurisdictions, but which individually they are physically, financially and technically unable to effectuate.

Such over-all regional control need not interfere with or duplicate normal administration and services at the local levels, but would rather consolidate the major functions and problems confronting them for their common solution and benefit. Such functions could conceivably include: Regional planning and zoning; sanitary drainage and flood control; major thoroughfares and transportation; water supply; uniform building regulations; regional school systems; and others.

Any such scheme of administrative control over the future development of our metropolitan centers must be sufficiently comprehensive and all-inclusive of the numerous factors involved in order that such control will contribute materially to the best interests of the whole region. Recognition of only the local phases of the problem cannot aid in properly shaping the growth of the whole in conformance with modern thought as to what shall constitute the ideal metropolitan community of the future. The groundwork must be laid upon a broad and firm basis.

We cannot continue to build and govern our communities without a comprehensive plan, an over-all specification and definite long range schedule. In projecting such a plan it is imperative that considerable thought be given to the condition of the undeveloped areas of the community well in advance of their subdivision into residential, commercial or industrial districts. This necessitates a study of the legal as well as physical aspects of the areas lying within the limits of a region so extensive as to be inclusive of all the territory and population which may probably ever become a part of the metropolitan community.

Legal aspects which should be considered involve primarily the following: (1) Recognition of the regional character of the problem. (2) Provisions for the permanent organization of the regional areas into a governmental subdivision having adequate powers to control the development within its boundaries. (3) Adequate consideration of the rural as well as the urban populations so that the interests of both may be respected and safeguarded. (4) Preparation and enforcement of regulations to govern all developments within the regional areas with the object of consolidating such developments into a comprehensive regional scheme.

Physical aspects involved should necessarily include a study of: (1) The entire area to be included in

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the regional organization, the boundaries of which are projected into the future as far as can be consistently estimated, preferably to the limits of the requirements of the ultimate maximum population. (2) A physical study of the area involved including topography for economic development; agricultural possibilities; underground deposits of commercial value; and preparation of a regional master plan giving recognition to the foregoing.

(3) A comprehensive long range plan of major improvements and utilities extensions covering the entire regional area and conforming to the master plan, as for example, comprehensive sewerage systems, involving trunk and outfall lines, together with necessary treatment works, and water supply and transmission systems. (4) Provision for various public projects such as forest preserves and park areas; recreation; building restrictions; land uses; and area and population density restrictions. (5) Provisions for uniform building control to cover type of buildings, their construction and the regulation of architectural treatment so far as legally possible.

It is believed that the scope of this problem is so extensive and concerns the people at large to such a degree that it should come within the powers of the State. Enabling legislation should be provided which will create a Regional Planning Authority to include all the territory which may ultimately be one community. The boundaries of such a district should be carefully determined, accurately and legally described, platted and recorded. No exception should be made of any incorporated places or other areas. The entire district should be created and treated as a whole.

Action Needed

Provisions for the financial maintenance of such an organization could be made by appropriating a portion of local or state taxes for this purpose; or the necessary moneys could be raised in a manner similar to that adopted in specially created districts organized for sanitary, public health, and other purposes. The intention would be to consolidate a number of separate activities now performed by many individual local jurisdictions, rather than to superimpose yet another new governmental monstrosity on the already tottering heap.

(1) Create a representative regional group of business and professional people, also public officials and administrators from local, county and state levels. (2) Establish a fund to defray research, technical, and related expenses. (3) Obtain suitable quarters, preferably without cost, for use of regional group and staff. (4) Organize the regional commission. (5) Recruit the research and technical staff. (6) Prepare and adopt a work program to include: (a) Delineation of the ultimate boundaries of the proposed regional area; (b) Establishment of geographical districts or zones to facilitate study and ultimate administration. (c) Exploration of legislation and frameworks of other regional organizations. (d) Study of needed legislation. (e) Cooperation of State legislators. (f) Public education.

In summary, my suggestion is to establish a regional master plan, legalize its boundaries, and activate an organization with powers and authority to insure the orderly development and administration of the Bay Area as an aid to solving present difficulties and to make a contribution to better living for the generations to come.

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THE WATER WORKS DIGEST

Water Treatment at Dayton

Dayton, Ohio, formerly dedicated a purification and softening plant in May, 1953, which cost $4,250,000. The city's supply is drawn from wells four miles away. As a part of the new project, the city laid 1½ miles of pressure pipe to reinforce the conduit between wells and pumping station. This pipe was the latest type of reinforced concrete steel cylinder pipe ranging from 48- to 72-in. diameter. The original conduit had been reinforced concrete. It had given no trouble and the flow coefficient had increased over the years and the concrete had hardened noticeably. The only problem had been a small amount of seepage through some of the joints. This is expected to be solved by the new rubber and steel flexible joint used in the new pipe line.

The new purification plant has a number of outdoor installations—4 settling basins, 4 slow mix basins, and 4 recarbonation chambers. Lime, soda ash, and alum are introduced into the raw water. After settling and recarbonation, the water passes through 26 in. of graded filter sand and 24 in. of graded gravel.

"Dayton's Water Treatment Plant Pays Its Own Way." By Loyd C. Huffman, Director of Water. *Civil Engineering*, January.

System Head Curves and Pump Selection

A system head curve is a graphical representation of the relationship between flow and hydraulic losses in a given pipe layout. Each layout has its own characteristic curve and specific values. In virtually all applications for pumps, at least one point on the system curve is given to the pump manufacturer in order properly to select the pump. In many cases it is desirable to superimpose graphically the entire system curve over the pump performance curve. The intersection of the pump head-capacity curve with the system head curve defines the operating point of the pump. The author gives several illustrations of calculating system heads and their use to show where a given pump will operate. One of these, for selection of high specific speed pumps near the dip which occurs at capacities to the left of peak efficiency, is shown by the accompanying illustration; in this, a shallow system curve intersects the pump curve at A, B and C, which might result in unsatisfactory operation.

"System Head Curves—Their Calculation and Use." By Melvin Mann, Peerless Pump Div. *Water & Sewage Works*, January.

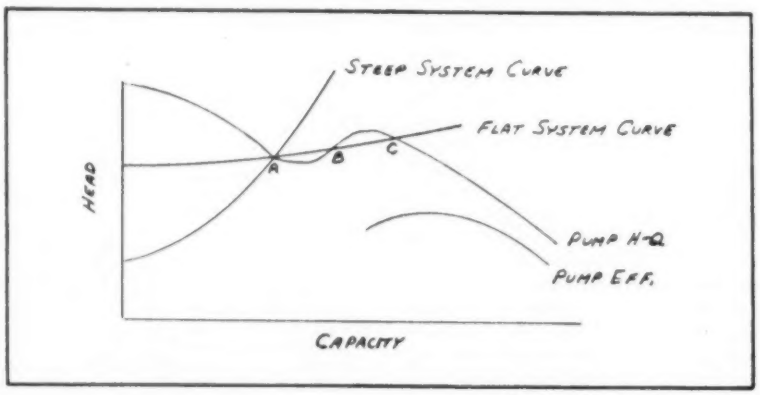
Water Intake In River Bed

Bellaire, Ohio, obtains an abundant supply of water by means of 400 ft. of 24-in. reinforced perforated concrete pipe laid on a shale bottom 22 ft. below the bed of the Ohio river, 100 ft. offshore, in 12 ft. depth of water. This discharges into a cell on the river bank. Three pumps with a combined capacity of 6 mgd could lower the water in the cell only a few inches, and it is estimated that 10 or 12 mgd could easily be obtained. Analyses show no relation between the water so obtained and that in the river.

"New Type Water Intake Proves Success." By A. R. Todd. *PUBLIC WORKS*, February.

Induced Infiltration As a Source of Well Supply

Lincoln, Neb., obtains its water supply from nine gravel-packed wells 46 to 90 ft. deep near the Platte river. There was evidence that considerable induced infiltration from the river furnished a part of the supply. Use of water from the river upstream for irrigation might consume all or most of the river flow, and there was a question whether a dry river bed would jeopardize the dependability of the city's water supply. The author describes the method of determining the extent to which the wells were drawing upon the river, and whether the underground valley carried sufficient ground water to supply the well field without induced infiltration from the river. The investigation showed that at least 80% of the city's supply came from the river by induced infiltration, and that the percentage will increase as the well field is expanded and the average daily with-



Courtesy Water & Sewage Works

● **SELECTION of high specific speed pumps near the "dip".**

The Wholesaler *and* Product Distribution

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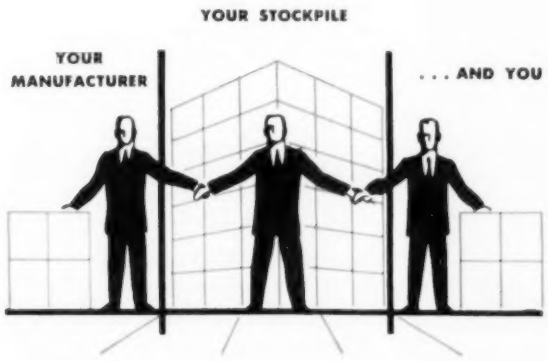

Add to that the higher selling cost the manufacturer would be forced to charge if he had to multiply his sales force to cover his market. And add the extra cost of the less-than-carload shipments he would have to make.

When you buy from your wholesaler you take advantage of his on-the-spot inventories of a wide range of products. At the same time, you keep abreast of product news, better ways to use old products, and new products designed to save you time and money. Add to that the fact that you cash in on the low selling price made possible by bulk shipments and low overhead.

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drawal rate is increased. Intermittent periods of zero surface flow past the well field would seriously jeopardize the dependability of Lincoln's water supply.

"Determining the Percentage of Induced Infiltration in Multiple-Well Discharge." By E. Bruce Meier, Asst. Prof. of Civ. Eng., Univ. of Nebraska. *Journal, American Water Works Ass'n*, January.

Water Quality And Corrosion

The author's aim in this paper is to demonstrate that water quality is a primary factor in corrosion (specifically at low flow velocities) and that the influence of dissolved oxygen and pH on corrosion rates is secondary. Experiments were made which are believed to demonstrate the behavior of solutions at corrosion cell electrodes. An explanation is given for the inhibitory effect of bicarbonate and carbonate alkalinity. Basic data are presented to which other data can be related in order to provide an organized approach to the water corrosion problem. Natural waters contain a corrosion inhibitor, varying in concentration or proportion from one supply to another. Without basic data on the primary, partial, or total inhibition of this natural ingredient, there is no hope of correlating the observations made on the effectiveness of other inhibitors or methods of treatment against corrosion.

"Corrosion by Water at Low Flow Velocity." By T. E. Larson and R. M. King, Chemists, Illinois State Water Survey. *Journal, American Water Works Ass'n*, January.

Radium in Public Water Supplies

The interest of the water plant chemist must focus on those radioactive components which are, biologically speaking, important potential hazards. The author gives a table comparing the toxicities of the various key isotopes in the light of such biological information as is available. Only such Alpha emitters are considered as occur naturally in water. If the contaminants involved were uranium mining or milling wastes or fission products, the problem would have to be reconsidered.

"Radium Content of Public Water Supplies." By John B. Hursh, Div. of Radiology and Biophysics, Univ. of Rochester. *Journal, American Water Works Ass'n*, January.

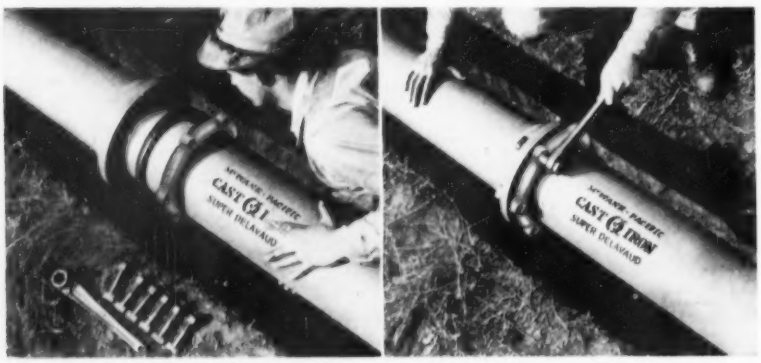
Measuring Radioactive Contamination in Water

For determining the amount of radioactivity in water, a variety of radiation detection instruments exist, but, for field or emergency conditions, instruments that are simple, portable, and readily available commercially are necessary. Electroscopes and Geiger-Muller survey meters meet these requirements. These are furnished by Nuclear Instrument & Chem. Corp., Tracerlab, Inc., and El-Tronics, Inc. Methods of using these for determining the concentration of activity in microcuries per cc, the amount of ionization produced during radioactive decay, and the relation between these are described.

"Survey Meters and Electroscopes for Monitoring Radioactivity in Water." By William J. Lacey and Bernd Kahn, Oak Ridge National Lab. *Journal, American Water Works Ass'n*, January.

Continuous Production Of Activated Silica

Most plants using activated silica prepare the sol by a batch method. This requires a duplication of equipment, as well as more physical space and more operating labor. The



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author describes a pilot plant used for manufacturing activated silica by a continuous process, using pure carbon dioxide. The cost of such a plant is relatively small compared with the expense of batch systems; the major cost item being the proportioning pump. The total capital investment for a plant adequate to prepare activated silica for treating 10 mgd with a dosage of 20 ppm would be $1,500.

"Continuous Production of Activated Silica With Carbon Dioxide Gas." By Robert V. Andrews, Assoc. Research Engr., Texas A & M College. *Journal American Water Works Ass'n*, January.

Control of Chlorine Dosage

To be successful, a program of chlorination must be built on a foundation of dosage control. The amount of chlorine required to disinfect a water supply one day, or even one hour, might be much too small, or too great the following day or hour with an equal volume of water. Residual chlorine indicates whether or not sufficient chlorine has been added, but should be checked by results accomplished. Automatic devices have made substantial contributions to facilitate dosage control, but plant operators must make manual adjustments for variations in chlorine demand.

"Fundamental Principles of Handling Chlorine." By V. W. Langworthy, The Chlorine Institute. *Water & Sewage Works*, January.

Fire-Flow Tests Important

The importance of frequent fire-flow tests was illustrated by the experience of Exeter, N. H. Such tests were made by the N. H. Bd. of Underwriters in 1941, 1949 and 1951, measuring flows at several fire hydrants at 20 lb. pressure. Between 1941 and 1949 pressure at all the hydrants fell materially. In 1950 the distribution system was reinforced with larger feeder mains and the result was shown by the 1951 measurements. The flows in these three years, and the flows required by the Underwriters at several hydrants were as follows: 1010, 755, 1400, 2500; 650, 335, 1650, 500; 660, 400, 1460, 2,000; 560, 275, 1740, 1,000; 88, 0, 152, 500. Due to the improvements made in 1950, the fire insurance rates were lowered.

"Rehabilitation of the Exeter, N. H. Water System." By Horace L. Clark. *Journal, New England W. W. Ass'n*, December.

Liquid Chlorine Storage at Tampa

Tampa, Fla. has built and has used since May 17, 1953 what is said to be the first installation in the United States of a chlorine storage tank for water treatment. Stationary storage was considered to be desirable to help insure an adequate and continuous supply of chlorine. Also a lower price could be obtained by purchasing in large quantities. The chlorine is delivered to the plant in a 30-ton tank car and transferred to the city's storage tank. This tank has a capacity of 45 tons, the additional 15 tons being a margin for ordering and receiving cars. The tank is mounted on a scale as the surest and simplest method of determining accurately the tank contents at any time and the amount used each day. The tank is not insulated nor shaded from the sun, as it is desired to feed only gaseous chlorine from the tank. As a precaution against unduly high pressure, the tank is finished in heat-reflective white enamel. At no time during a hot summer with a relatively full tank did the tank pressure exceed 128 psi. The overall cost of the installation was about

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M & H Gate Valves may be ordered equipped also with usual accessories such as gearing, by-passes; rollers, tracks and scrapers; double square bottom, indicators, or for hydraulic cylinder operation. For complete information, write or wire M & H Valve and Fittings Company, Anniston, Alabama.
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$16,000, of which $12,000 was for materials and equipment.

"Liquid Chlorine Storage Tank Installed at Tampa, Fla." By J. S. Long, Supt. *Water Works Engineering*, January.

Shipping Chlorine In One-Ton Containers

Shipping one-ton containers of chlorine to consumers by rail involves transferring them from car to truck for final delivery to the plant, with accompanying hazards. Also the truck body often was not adapted to prevent the containers from rolling against each other during transit. A safer method is to transport the containers directly from manufacturer to plant by truck, which eliminates the necessity of rehandling. A special truck body containing cradles exactly fitting the containers, and clamps at each end of each container to prevent their sliding in the containers has been designed by Diamond Alkali Co. and offered for use by members of the Chlorine Institute. Not only is this method of transportation safer than combined car and truck, but in many cases it is cheaper. Detail plans of the truck body are given in the article.

"A Wider Horizon for Chlorine in One-Ton Containers." By J. H. Wilharm, Diamond Alkali Co. *Water & Sewage Works*, January.

OTHER ARTICLES

"East Delaware Tunnel Construction To Be Completed Six Months Ahead of Time," for New York City's water supply. Civil Engineering, January.

Conserving South Dakota's artesian supply. "Capping Artesian Wells at Fort Randall Points Up South Dakota Water Problem." Engineering News-Record, Dec. 31.

"How to Trace Ground Water Flow." Three convenient methods are described—use of dyes, of soluble salts, and the electrolytic method. PUBLIC WORKS, February.

Selecting plumbing materials to withstand corrosion by a given character of water. "Water Analyses Aid in Selection of Plumbing Materials." By Vito F. Nole, Chase Brass & Copper Co. PUBLIC WORKS, February.

Cleaning device for sedimentation basin designed by St. Louis, Mo. engineers. "Modernization of St. Louis, Mo. Water Plant Brings New Ideas." By E. E. Easterday. Water Works Engineering, January.

"Diatomite Filters." Description of the various makes. Water Works Engineering, January.

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Revenue from Water and the Cost of Furnishing It

The revenue, per thousand cubic feet (MCF) of water sold by the City of Long Beach, Calif., during the past fiscal year, amounted to $2.064. Costs of producing the water were as follows: Source of supply (29¢), treatment plant (12.6¢), pumping (6.3¢), purification (1.7¢), transmission and distribution (31.5¢), and commercial (14.2¢)—a total of 95.3¢ per MCF for operating expenses. General and miscellaneous expenses amounted to 62.4¢ per MCF, this item including depreciation and bond interest. Depreciation not set aside in cash and bond retirement amounted to 60.3¢ per MCF. Net balance available for replacements and additions amounted to 44.2¢ per MCF.

• • •

Fluoridation Reduces Tooth Decay

After adding fluorine to the city water for the past four years, Oshkosh, Wisc., reports that tooth decay among children of kindergarten age has decreased 27.6 percent.

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Public Employees: Overlooked Quotients in Safety

H. D. JONES

SAFETY as a movement started in and for industry, but it was 35 years before one of the major quotients in safety was ever given attention. Even today that quotient: the public employee—is all too scarcely recognized and all too sparsely directed to a complete program of safety.

There are more than seven million employees in various municipal, county, state and Federal governmental agencies. These seven million must be enlisted and trained in safety for their own good, and the good of all mankind.

The old adage, "Begin at the bottom and work up," needs to be turned completely around in this field. What is needed most is to get the top bracket concerned for the safety of public employees. The proper leadership and adequate facilities must be provided by management if the safety of this mass of workers is to be given proper focus.

Safety is expensive. Yet, safety pays greater dividends for every dollar invested than is true in any other area of expenditures. The efforts being made to this end, namely educating management to spend money on safety, are good, but they are not enough. There must be more effort spent in bringing management to see that its own leadership must first be invested. Then facilities and techniques for safety must be magnified. All of this leadership and all of these facilities must be directed to the human quotient, the safety of the public employees themselves.

It is appalling to know how few public employees have ever had safety brought forcibly to their attention. They have never been made to realize that their own safety is their own responsibility. This state of affairs is chargeable almost exclusively to the inertia of public executives.

For example, a garbage collector was continuously hurting his hands, legs and back, and when the official over him was asked what he was doing about it, amazingly asked, "What could I do?" That is not being naive, but just ignorant.

Private industry has recognized this importance far ahead of public management. One industrial leader cut his insurance costs $18,000 in one year simply by paying much less than that for a safety director, in addition to having the satisfaction of saving so many people from injury, and virtually eliminating the costly loss of manhours from his jobs.

Too many state employers poohpooh the idea of safety. They don't even read the papers, apparently, for they express surprise when learning that employees of the state have been killed, and many others injured, because of the lack of simple safety techniques.

There is one field in which this idea of safety is certain to become revolutionary. It is not hard to predict that within a normal lifetime, the traveling public will be asking for "Safety Maps," along with or even in preference to "route maps." Areas that have a bad record on accidents will be avoided, and those where accidents are controlled, and where safety is a paramount concern, will be the chosen routes for travelers, the chosen sites for new home-making, and the favored spots

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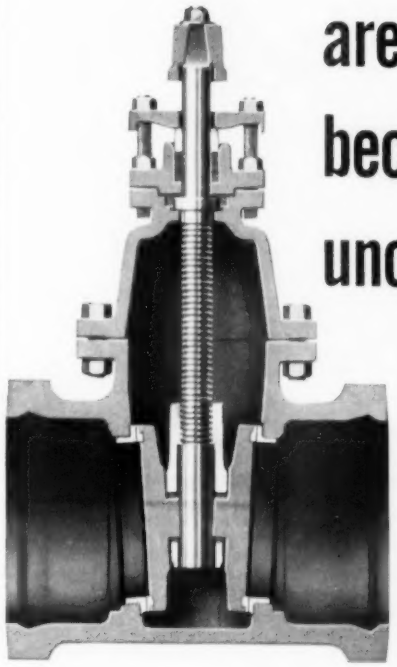

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There's a sort of reverse English to designing R. D. Wood Gate Valves. The point is to make them as simple as possible, to eliminate all the ingeniously complicated parts that look good in the blueprint but cause operating failures deep down in the lines. You'll appreciate their rugged simplicity when you put them to the test. R. D. Wood Gate Valves are built to function for generations of trouble-free flow control.

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Internal mechanism comprises only three parts—the spreader and two discs. Usual small wedges and delicate parts are avoided. Fully opened valve provides unobstructed passage for full pipe capacity.

Rising or descending, discs are free to revolve completely. In closing, discs are fully lowered before spreading action begins. Wear on bronze faces of discs and seats is evenly distributed.

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This intimates a happy combination of education, enforcement, and engineering. Education is paramount. Engineering is an ally that must always be in the picture. But unfortunately entirely too much emphasis and confidence has been placed in enforcement. It is by far the least efficient of the three emphases, whether it be operations on a given job or on the highways.

This is a plea for a program of public safety consciousness among public management, with a program adequately devised, and as adequately administered to teach safety to the public's employees. Until public management is ready to take that energetic and intelligent step, the major quotient in public safety will still be overlooked as it has been so woefully overlooked up to this point.

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Sewage Lagoons

(*Continued from page* 89)

will make anyone ask who would like to live near a sewage pond?

A lagoon must be placed at least a mile from town and a half of a mile from the nearest home, it must consist of at least forty acres of reasonably flat land. Because of the lack of flat land that is isolated, the cost of lagoons in Minnesota has not been comparable to costs reported from North Dakota. In fact, we find that the customary treatment plant, using the best in design, has been comparable in costs to lagoons. Use of the latest proven methods of sewage treatment permit complete treatment at reasonable cost.

A lagoon, with sufficient holding time, will provide excellent treatment but it should be used *after* removal of the health hazard. This implies that the lagoon is the final or polishing treatment and is not suitable as a sole treatment. This use of lagoons for final treatment has long been recognized and will receive more application as the need for higher degrees of treatment become imperative; but their use for treating raw sewage involves a health hazard; and, in this area, higher expenditures than would be demanded by the more customary procedure of treatment plant first and then lagoon after the need justifies it.

• • •

"Jack" Ritter

(*Continued from page* 17)

posed Illinois test road is still much in the news, as planning of the project continues. A very important aspect of the investigation was emphasized recently by A. E. Johnson, president of the AASHO, in a recent speech in Detroit when he said: "If the task is undertaken, it should be under the administration of people above reproach . . . who are well known as experts in their respective lines. The release of unauthorized information or the premature release of results, especially as they might apply to economic cost data or the sizes and weights of vehicles affecting certain destructive tendencies in pavements, would not be allowed . . ." After the bitter experiences which followed publication of the results obtained on the Maryland test road, this is very sound policy. Engineering findings of the Maryland project were almost lost among the clamoring of the propagandists, who found wonderful material for blasts against the trucking industry in the test reports.

Business or Profession?—Is engineering a business or a profession? This question is being batted around in engineering circles over the country these days as a result of 15 reputable engineering firms submitting

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competitive bids for engineering services to C. R. McMillan, chief highway commissioner of South Carolina, in response to an advertisement for such services. Since the codes of ethics of many organized engineering groups frown upon competitive bidding as being "unethical", the question is both timely and pertinent. If we had to stand up and be counted at the moment, we would line up on the side of codes of ethics, believing that engineering, to be a profession, must have members who behave in a professional manner. Whatever you may feel about the matter, it is certain that engineers as a group must face this problem squarely soon, since competitive bidding for engineering services is becoming more and more prevalent all the time.

Soil-Cement — We haven't said much about soil-cement lately, but that doesn't mean it is not good. It is, and many groups are finding it very useful for street and highway improvement. An example of this is seen in its use recently in the construction of a highway base course by the Wisconsin State Highway Commission. A 6-inch base was constructed on a 21-mile section of State Highway 54. Built in a section where the surface soils are principally peat and sand, and practically no aggregates or clay are available, the project utilized from 10 to 11 per cent of cement by volume of the compacted mixture. If you're interested in soil-cement, drop a line to J. A. Leadabrand at the head office of the Portland Cement Association, 33 West Grand Ave., Chicago 10, Illinois; he'll send you more information than you know what to do with.

From Hither and Yon — A California State Highway budget which provides $205 million for major construction has been approved for the fiscal year beginning July 1, 1954; this is believed to be the largest annual budget of any state highway department in the history of the country. We hear that Col. Marr, head of the department of Civil Engineering at V. M. I., has done a remarkable job of leadership in the highway needs study in Virginia; recommendations of the Marr Commission are now before the state legislature for action. George Sowers of Cleveland has submitted a report to Governor Emerson of Vermont stating that there is neither need nor economic justification for toll roads in that state. Choctaw, Inc. of Memphis is now manufacturing precast reinforced concrete bridge

1. Large illustration shows Singl-use Fiberform ready to be filled.
2. Filling plate and collar simplify pouring concrete into form.
3. Completed meter box barrel.
4. Meter box with cover in place.

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slabs which have been approved for use by the Arkansas and Mississippi Highway Departments. This is a critical time for the future of highway development in 14 states whose legislatures meet in regular session this year; special sessions will be held in some other states and highway referendums will be submitted to the voters in still others.

• • •

"Doc Symons"

(*Continued from page* 18)

Miami, remember what G. R. Herzik, Texas' Chief Engr. said about Texas, to wit: "More land and less grass, more cows and less milk, and more rivers and less water, than any other State in the Union."

★ ★ ★

Small World No. 24 — When the Westchester Water Works Conference held a testimonial dinner for Arthur Richards, retiring Village Engineer of Larchmont, N. Y., one of the guests at the head table was Earl Devendorf, Director, Bur. of Environmental Sanitation. Earl showed up with a photostatic copy of a banquet program of some 30 years ago. The program was for a meeting of the N. Y. State Pub. Wks. Dept, for which Art had drawn the illustrations. Art and Earl had been cub engineers on the staff at the time. Just goes to show that your past never gets away from you—Small World!

Most of you know that the WSWMA doesn't allow exhibitors at water and sewage conventions to hand out souvenirs. Advertising by souvenirs is an old American custom. Walt Brown, Project Engineer, Builders-Providence has a couple of small pocket mirrors dating back to 1902. One was issued or handed out at the U.S. Dental Assn. Meeting in the Music Hall in Providence, R.I. On the reverse of the mirror was this bit of advertising:

Extracting—25¢; with gas—50¢. Cleaning 75¢.

Filling with Silver—75¢; with Platina—$1.00; with gold according to size.

Full set of Teeth—$4.00; Full set of Teeth, Very BEST—$8.00.

★ ★ ★

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★ ★ ★

Joe Wafer, a Nuchar man, whose face nowadays, is too seldom seen

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around water works conventions, regularly receives a house organ called "Manny Wolf's World", being mostly about the people who patronize Manny's restaurants. — Joe sent me an issue recently with a picture in it of a fellow who looks like me.—No Joe, I am not using an alias.

★ ★ ★

Historical — The first Short Course for Sewage Works Operators held in Illinois took place in 1939. Five men who attended that session are still in the business. Except for 1940 the course has been held each year and it has been so popular that now two courses a year are being held.

★ ★ ★

Imagine My Surprise —A short time ago, I was watching a television show, narrated by Edward R. Murrow, on the report of the President's Materials Policy Committee. Imagine my surprise when Ed Murrow said that one of the most important raw materials is water, and then proceeded to introduce *Mr.* Abel Wolman, Professor of Sanitary Engineering of Johns Hopkins University in Baltimore.—*And* there was Abel, looking as large as life and almost as real, sitting in his shirt sleeves and neat bow tie, telling the country at large, the importance of water supply and its distribution over the country. Made a fellow proud to be in the business.

★ ★ ★

News Notes from Brushy Bend—The first quarterly meeting of the N.W. Ohio AWWA was held at Archbold, Ohio, Jan. 27. Tours of the filter plant took place from 2 to 4 pm, luncheon was at 6 pm for $2.25 per plate, and the business meeting was held at 7 pm.

Monmouth and Ocean Counties Sewage and Industrial Wastes Assn. of New Jersey held its annual meeting on Jan. 28. Adam Reichardt of Elberon, N.J. is Chairman and Wm. Stanley Applegate is Secretary.

January and February saw two meetings each of the North Jersey Water Conference. At one of the January Meetings AWWA Secy. Harry E. Jordan spoke on "Wages and Salaries in Water Works Industry".—On Mar. 5, the scheduled topic for discussion is "Water Requirement for Air Conditioning."

★ ★ ★

Hope I see you all in Seattle at the AWWA Meeting in May.

V.T.Y.—Doc Symons

PUBLIC WORKS

EQUIPMENT NEWS

Published Monthly **March, 1954**

Catch Basin Cleaner For Pippin Excavator

New Orange-Peel Bucket Provides Inexpensive Cleaning Attachment

WHITE RIVER JUNCTION, Vt. —A catch-basin cleaning attachment is now available for the Pippin excavator. It provides an inexpensive machine for cleaning such basins quickly and economically. Control is completely hydraulic. An orange-peel bucket, 13-inch diameter closed and 18 ins. open, with a capacity up to 2 cu. ft., can reach 19½ ft. below ground for cleaning, and can be raised 9 ft. above ground for dumping. Mounting and dismounting are simple and take about an hour. This excavator can be used as a backhoe (to 10 ft. deep), for backfilling, grading and many other purposes. More from Pippin Constr. Equip., Inc., White River Junction, Vt., or by using the coupon. Circle No. 3-1.

New catch basin cleaner adds to the versatility of the Pippin Excavator

Survey Transit Weighs Only 9.1 Pounds

SAN FRANCISCO, Calif.—Here is a lightweight transit (weighing only 9.1 pounds) designed especially for mountain area survey work and for contractors doing construction work which requires a precision instrument. It is made in Japan to high standards of accuracy. Glass is 23 power; stadia interval is 1:100. It has vertical and horizontal circles; erecting eyepiece; and graduations cut on silver; lens are coated. Verniers read to 1 minute. Comes in a hardwood case, with sun shade, cap, plumb bob, magnifier, cleaning brush and other items. Tripod, included in the price, has US standard thread, and is of extension type. For more data write Union Mercantile Co., 465 California St., San Francisco 4, Calif., or use the coupon. Circle No. 3-2.

Lightweight imported 5¾" survey transit offers accuracy at a low cost

• • •

Dasco dextrex, a new air entraining agent for concrete, contains no inert fillers; mixes immediately when applied; the concrete flows more freely and requires less spading, rodding and vibration. This material (which will give 3 to 6% of air entrainment) also makes concrete watertight by increasing its density, and more resistant to weathering, abrasion, frost, and sea water. It has been developed by Dasco Chemical Co., Inc., 1602 Thames St., Baltimore 31, Md.

Rock Buster Breaks Oversize Material Windrowed on Road

SAN ANTONIO, Tex. — The BMCO traveling rock buster reduces oversize rock, in pit run material, to the sizes best suited for macadam or asphaltic road base and does it right on the roadway. Gravel or various forms of rock with their desired binder may be dug from their natural formations with power shovels, loaded in trucks and dumped directly on the roadway in continuous piles. A motor grader then blades off a windrow for the 4-foot wide and 2-foot high throat of the Rock Buster so it can be towed astride the windrow. The motor grader then follows the Buster moving the blended material to the edge of the base area and providing space for working on the next windrow of unbroken material. Repetition of this cycle results in all oversize being reduced and blended with binder material ready for the final blading and shaping for a perfect road base.

Rock buster has multiple hammers which reduce the oversize materials

The Rock Buster is a multiple hammer type machine, equipped with 18 36-lb. hammers rotating at 1000 rpm and powered by a 90 hp diesel engine. The machine is manufactured by the Lewis-Browning Mfg. Co., P.O. Box 2707, San Antonio, Texas. Use the coupon and circle No. 3-3.

Parsons Trenchmobile Has Increased Bucket Width

NEWTON, Ia.—Increased bucket capacity with cutting widths of 8, 12 and 16 ins. has been announced by Parsons Company for its Model 88 pneumatic-tire mounted Trenchmobile. Other improvements include hydraulic boom hoist with positive down crowd and three-point suspension of the wheels from the Trenchmobile frame. With the increased trench width, the range of usefulness of the Model 88 Trenchmobile will be extended. Workers can now get into the wider trench when installing pipes, tiles and conduits. Trenches for large size pipe, tile and conduit systems are now within operating range of the machine.

Hydraulic hoisting and lowering of the digging boom provides positive down crowd for working in the most severe soils. This also maintains an accurate grade. The speed of raising and lowering the boom can be increased and is better controlled by the operator than formerly. Steering is of the automotive type for both digging and road travel. The turning radius is 19 feet 4 inches, and the wheel base 7 feet 3 inches. Further information from Parsons Company, Newton, Iowa, or use the coupon and circle No. 3-4.

Compact Trenchmobile works in close quarters, cuts trench to 16-in. wide

72-in. Rotary Motor Has Leaf-Mulching Attachment

A 72-in. power-take-off rotary mower, with a leaf-mulching attachment, has been introduced by Worthington Mower Company, Stroudsburg, Pa. This unit cuts through dense overgrowth with ease, and with the leaf-mulcher added, can quickly reduce leaves and other cuttings into a fine powder, putting nutriment back into the soil to improve the turf. It features two staggered cutting bars that completely eliminate uncut streaks, and large wheels for maximum flotation. The unit may be pulled by a Worthington Model "G" Tractor with SAE power-take-off, or any two-plow tractor with adequate power for cutting and mulching. Circle No. 3-5.

The controlled closing valve is a new product of the Simplex Valve and Meter Co., 38th & Upland Sts., Philadelphia 42, Pa. This Type CCAV valve was developed to overcome the problems of surge and water hammer when filling pipe lines, control speed of line closure, vent air and, if necessary, discharge water to prevent damage and admit air to protect against pipe collapse from line breaks.

A Super Hole-A-Matic digger and tunneler is announced by Multi-Matic Corporation, 14741 Bessemer St., Van Nuys, Calif. This tool digs easily at any angle, requires only one man to operate and, with shaft extension, will drill 15 feet or more, making it excellent for sewer and water work.

Lorain Announces 6-Ton Moto-Crane Convertible to Shovel

LORAIN, O.—Thew Shovel Co. has added a 6-ton "TL" Moto-Crane to its line, marking Thew's re-entry into the small rubber-tired crane field. Like other Lorain cranes, this new model is not limited to crane service only, but can be converted readily to a ⅜-yd. shovel, hoe, clamshell and dragline. Extra equipment is also available, including front-wheel hydraulic brakes, center sections for extending the boom, precision boom lowering device, cable boom stop and outrigger boxes and beams. Full mechanical details are available from Thew Shovel Co., Lorain, O., or by using the coupon. Circle No. 3-6.

• • •

Michigan Adds Two ¾-Cubic Yard Power Shovels

BUCHANAN, Mich. — Clark Equipment Company has announced the addition of two new ¾-cubic yard capacity power shovels, crawler and truck mounted, to its "Michigan" line of excavators and cranes. The ¾-cubic yard equipment will be manufactured in two truck-mounted models and one crawler model.

The development program for the new unit, started more than three years ago, has resulted in a completely new design. Advanced styling principles have been applied to the cab to assure safer and more efficient operation, and numerous mechanical innovations have been incorporated in the design of the new units.

Two units, one a crawler-type and the other truck-mounted, have been undergoing field tests for the past 18 months. Circle No. 3-7 on the coupon for more data.

• • •

Simple Unit Handles Automatic Proportioning for Chlorinators

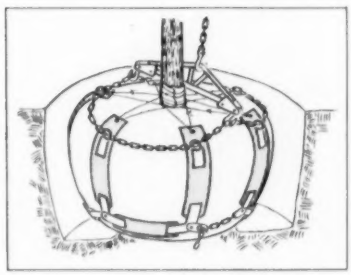
HATBORO, Pa.—A new corrosion resistant automatic proportioning component for chlorinators has been developed by Fischer & Porter to feed chlorine to water or sewage lines in a direct and preset proportion to the flow rate, however it may vary. This new unit will handle the whole proportioning job under conditions existing at the majority of water and sewage installations. It can be incorporated easily into F-P standard solution feed chlorinators. Ratio controllers, complex

transducers or pressure transmitters are not required. The component is operated by differential pressure coming directly from an orifice plate. Once an initial setting for a desired proportion of chlorine is made manually on the chlorine rate valve, the automatic proportioner takes over.

For more details write Fischer & Porter Company, 20 Jacksonville Road, Hatboro, Pa., or use the coupon and Circle No. 3-8.

How to Move Trees Faster and Better

MINNEAPOLIS, Minn.—Here is an improved sling that makes it much easier to move medium and large trees. Broad sections of belting with pivot fastenings permit the sling to conform to the tree ball. A lifting yoke distributes the weight and controls the balance of the tree.



Adjustable sling simplifies movement of medium and large trees

Sections can be readily added or removed to get the proper size sling. Complete undercutting of the tree is not needed with this sling. And in lowering the tree into the new hole, the trunk can be held in almost any position desired, even nearly vertical. For details write Herman F. Beseler, 253 Plymouth Bldg., Minneapolis 2, Minn., or use the coupon. Circle No. 3-9.

A 5 KW, AC generator has been added to the line of lighting plants made by Katolight Corp., Mankato, Minnesota. This new model can generate 60-cycle current at standard voltages of 110/220, single phase or 3 phase, 220/440. It is available with or without automatic voltage regulator, and is powered with a 2-cylinder, 4-cycle type air-cooled engine. The entire unit is mounted on wheels with retractable handles. The engine and generator are sufficiently housed for outdoor use. Can be equipped to be wheeled by hand or of trailer type.

New Attachments for Hough "Payloader"

LIBERTYVILLE, Ill.—New attachments and improvements on the 4-wheel drive TM Payloader, according to Frank G. Hough Co., manufacturers of this equipment, include pusher and towbar plates, single or dual railway couplers, air compressor attachment, switchman's platform and catwalk, hydraulically driven winch and 4-wheel vacuum booster brakes. When the tractor is used for hauling trailers, connections can be furnished to provide operation of vacuum brakes on the trailer. The rear-mounted winch has a 30,000-pound line pull. Full details on the Model TM and on any of this special equipment can be obtained from Frank G. Hough Co., Libertyville, Ill., or by using the coupon. Circle No. 3-10 for complete data.

Towing and pushing accessories developed for the Hough "Payloader"

New Portable Pump For Water Drainage

RICHMOND, Calif.—Jacuzzi Bros. Inc. announces a completely new and vastly improved line of self-priming contractor-type centrifugal pumps. Built to handle muddy or unclear water, and for rapid movement of large volumes of water, they are especially suited for use by contractors for de-watering excavations and for draining ponds and ditches.

The semi-open impellers are non-clogging with adjustable clearance to compensate for wear; and a special renewable impeller wear plate prevents wear on the impeller case itself. A separate opening in top of the case permits easy priming without need for extra fittings or disturbance of piping.

The new pumps are available in a wide range of horsepower ratings with choice of electric motor, gasoline engine or heavy-duty transmission head for belt drive. For complete details, write for illustrated bulletin, "JCT-2"; c/o Jacuzzi Bros. Inc., Richmond, California, or St. Louis 23, Missouri. Or use the coupon and Circle No. 3-11.

Swing Loader Cuts Time in Tight Spots

CHICAGO, Ill.—The 180° boom swing, permitting discharge of the load left or right, in addition to front, without moving the loader out of the loading position line, is a feature of the new Speed Swing Loader recently announced by Pettibone Mulliken Corp., Chicago. This feature is said to cut loading time materially in tight spots. The loader is available with 2 or 4-wheel drive, optional 4-wheel steer, ¾ or 1-yd. bucket, and with the following accessory attachments: fork, crane hook, backfiller blade, and 4-yd. snow bucket. These attachments are quickly interchanged. An outstanding feature is a 30° bucket tilt-up, providing shovel action. More from Pettibone Mulliken Corp., 4700 West Division St., Chicago 51, Ill., or use the coupon and circle No. 3-12.

180° swing adds to versatility of the Pettibone-Mulliken loader

Shoveloader is a Basic Bulk Handling Tool

MINNEAPOLIS, Minn. — The Model 20 Shoveloader, announced by Baker-Lull, with a 12-cu. ft.

Bulk materials handler has loader bucket same width as the machine

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We are offering all of the following equipment for immediate sale — $1,200.00 cash — f.o.b. storage in Anderson, Indiana

1—60 HP Century motor—2200 volt, 3 phase, 60 cycle, complete with sliding base. speed 1160 serial #1U1407

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2—Westinghouse oil immersed magnetic starters.

2—60KVA Condensers with switches. These capacitors are designed to maintain a minimum power factor of 98% for the primary service to the 60 HP and 40 HP motors.

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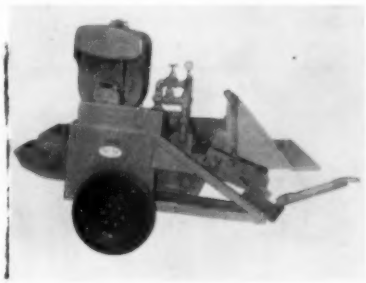
bucket, lifts 1500 pounds to a height of 7 ft.; or it can be equipped with lift forks or special bucket and crane hook to handle most any kind of material. Gasoline powered, the Model 20 has a travel speed of 14 mph, with 4 forward and one reverse speeds. Full circle visibility is provided for the operator. Write for form AD-60 to the Baker-Lull Corp., 314 West 90th St., Minneapolis 20, Minn., or use the coupon. Circle No. 3-13.

New Model of Multi-Pug Portable Asphalt Mixer

LAFAYETTE, Ind.—The new model JR-54 McConnaughay Multi-Pug Portable Asphalt Mixer has been announced by K. E. McConnaughay, Lafayette, Ind. Second in



Two tons per minute of cold mix is McConnaughay Model JR-54 capacity

a line of units designed to handle cold mix, this model has a capacity up to two tons per minute. Proportioning of asphalt and aggregate is volumetric. For full data circle No. 3-14 on the coupon.

Low-cost kilowatts with "pedigreed" horsepower is the combination offered in a new generator series powered by Chrysler industrial engines. The series includes three sizes of 50, 30, and 20 KW ratings, and has wide application in the industrial and commercial fields. Ready-Power Company, 11231 Freud Ave., Detroit 14, Mich.

A water separator and fuel filter for diesel construction equipment has been announced by the Fram Corporation, Providence 16, R. I. The fuel filter unit takes out dirt, rust, and other solid contaminants down to 1 micron while condensing water in the fuel into large droplets; then the clean fuel passes through a connecting nipple into the water separator unit. It can be quickly and easily installed on diesel engines up to 225 horsepower.

A truck crane version of the recently improved 205 excavator is now in production by Koehring Co., 3026 West Concordia Ave., Milwaukee 16, Wis. This unit will lift loads up to 15 tons. The operator's cab has been redesigned and operating levers have been rearranged for easier handling. This crane can be adapted to clamshell, dragline, shovel and hoe work; when equipped as a shovel, the dipper is tripped electrically. For special high lift crane service, straight boom jibs, 15, 20, 25, or 30 feet long, with cable and counterweighted hooks, are available. The truck has 10 forward speeds, ranging from a low of 2.03 mph to 32.6; and two reverse speeds, 4.08 and 2.04 mph. Front and rear turn signals are built into the chassis, as are standard driving lights. The unit is equipped with outriggers for extra support during stationary operations, and is provided with marker lights for night work.

Extra-Wide Belt Conveyor Handles 800 Tons an Hour

SIOUX FALLS, S. D.—Kolman Mfg. Co., is now producing a 36-in. wide portable belt conveyor in various lengths. This carries an 8′ x 48″ vibrating screen which is entirely supported by the conveyor during operation and need not be removed during transportation. The accompanying photo shows one of these heavy duty conveyors loading gravel and scalping out oversize with a Kolman vibrating screen. The conveyor shown is 50′ long and the screen is 8′ x 48″. This unit is claimed to turn in a remarkable performance, even under the wet, sticky conditions shown in this illustration. It is screening gravel and loading out 10-yd. trucks in less than a minute, or at the rate of over 800 tons per hour.

Vibrating screen attached to conveyor scalps out oversize material

Information from Kolman Mfg. Co., Sioux Falls, S. D., or by using the coupon. Circle No. 3-15.

Col. Jack Hinman Will Return in June

Col. Jack J. Hinman, Jr., who has been teaching at the University of Puerto Rico, Mayaguez, P. R., will return to this country next June and will be open for other engagements. He says he has enjoyed his stay in Puerto Rico, but will be glad to be back.

• • •

ASSOCIATIONS

The 9th Purdue Industrial Waste Conference will be held on May 10 to 12 at Purdue University, Lafayette, Ind. Prof. Don E. Bloodgood, Civil Engineering Bldg., Purdue University, Lafayette, Ind., is chairman.

The 8th Annual Industry-Faculty Conference will be held at Louisiana State University, Baton Rouge, La., April 6-7. More information from Paul C. Koons, Jr., Acting Director, Engineering Experiment Station, at the University.

The 7th Florida Municipal and Public Health Engineering Conference will be held at the University of Florida, Gainesville, Fla., March 9-10. The theme of the conference will be "Community Planning and Development" and emphasis will be on realty subdivision regulations. More from Prof. John E. Kiker, Jr., College of Engineering at the University.

A one-day conference on Instrumentation in Water, Sewage and Industrial Waste Treatment will be held at Manhattan College on April 22. More information from Brother Joseph McCabe, Civil Engineering Dept., Manhattan College, New York 71, N. Y.

The Western Canada Water and Sewage Conference will hold its annual convention at the Saskatchewan Hotel, Regina, Saskatchewan, on Sept. 22 to 24, including a one-day school for operators on the 22nd. Further information from W. J. Waddell, Secretary-Treasurer, 3610 Manchester Road, Calgary, Alberta.

• • •

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Young man, recommended by the Editor of Public Works, desires position as engineer for a municipality in Northern New Jersey or Metropolitan New York Area. Holds BCE and MCE degrees. Has had experience on design and construction, with consulting engineer and with municipalities. 27 years old; married; now employed. Address Box C-3, Public Works.

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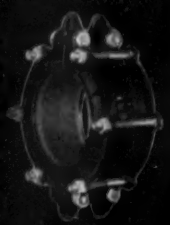

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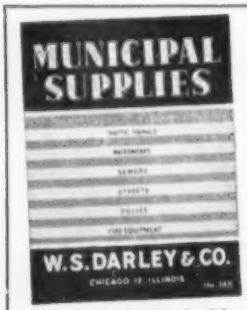

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—Worth seeing

Snow removal trucks loaded one a minute, curbside snow in a 3 foot windrow cleared at 2 MPH in steady runs—that's the meat of this Seaman Self-Propelled Pulvi-Mixer operation at Alexandria, Minn.

Grumman's new sweeper, showing Eriez magnetic unit lowered in position to snatch dangerous nuts and bolts from runways and hangar areas and keep such small metal ware from being sucked into jet motors.

Worth Seeing is hearing that it is just that. Thanks!

The most valuable garbage disposer in the world was given as a Christmas present to the Leo Ferguson family of Lakewood, California, by the Given Mfg. Co., of Los Angeles.

Here goes the 500,000th water meter into the Los Angeles water system. Sam Morris, water works general manager, Mr. and Mrs. Harry B. Ross whose water use it will measure, are in rear row. This one's a Neptune.

This is not just a picture of a hole: it's an interior shot of a 48" diameter tunnel in Charleston, W. Va., using Armco liner plates. Illustrating again the trend to tunnel rather than dig for big sewer construction projects.

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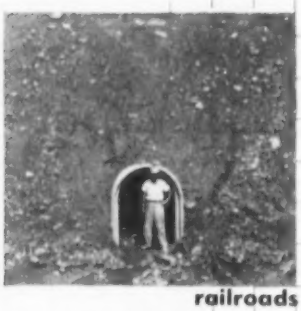

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WORTH TELLING

by Arthur K. Akers

★ **OUR OLD BIRMINGHAM** Phillips High friend Jack Turner of Barber-Greene Company, Aurora, Ill., knocked Managing Editor Ed. Rodie of PUBLIC WORKS for a pleasant loop with word that Ed's suggested name for B-G's new Model 550 belt loader had won the prize. We saw it; a clock radio that will insure his catching the 7:34 A.M. Erie commuter train hereafter by more than the usual eyelash.

★ **HAROLD A. EDLUND** moves up to general sales manager, the Butler Manufacturing Company, of Kansas City. He will direct sales efforts of all Butler products, including their buildings as advertised in PUBLIC WORKS.

★ **O'BRIEN & GERE,** consulting engineers, Syracuse, N. Y., have added Samuel J. Grosso, Frank A. Loguidice, and Joseph I. Phillips as associate members of the firm.

★ **NEW TRUSTEES FOR** Toncan Culvert Manufacturers Association are: Lynn J. Busby, Madison, Wis.; Walker R. Young, Denver; Rex E. Rhine, Decatur, Ga.; and Col. Hubert E. Snyder, Cleveland. In the same order, the same gentlemen are also president, vice-president, secretary-treasurer, and managing director.

★ **WE LEARN WITH** personal sorrow of the death of D. Birney Stokes, retired; formerly vice-president in charge of sales for the United States Cast Iron Pipe Company, at his home outside of Burlington, N. J., where his office long was.

★ **OTHER U. S. PIPE** news is establishment of new direct sales offices, replacing independent representation, as follows: Los Angeles, with George J. Bogs, formerly of Chicago, as sales agent; Seattle, with Robert N. Park as northwestern sales agent. Syracuse, N. Y., is also a new sales office, under J. Perry Emerson, New York state sales agent.

★ **WILLIAM H. "Mac" McALLISTER** becomes a division sales manager for Osgood-General cranes, excavators, and materials handling machinery, with Dallas headquarters. Texas, Oklahoma, Kansas, and western Missouri are his bailiwick.

Mr. McAllister

Mr. Smith

★ **DORR COMPANY** announces William E. Smith as assistant sales manager, at Stamford, Conn.

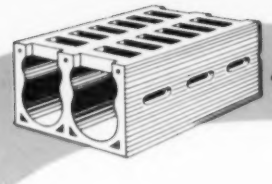
★ **HOMELITE CORPORATION,** Port Chester, N. Y., appoints R. J. "Ray" Marschalk as Chicago district sales manager, at Melrose Park, Ill. Also, R. S. "Bob" Kennedy, formerly of Fresno Calif., will manage the Melrose Park branch.

★ **R. D. WOOD COMPANY,** Philadelphia, sent us the story of 150 years of the company, made into one of the best looking and most fact-filled books of the sort that we have ever seen. We shall treasure it.

★ **CATERPILLAR TRACTOR** news includes: Henry H. Howard, elected a vice-president, in the recently created engine division; J. H. Gill, manager of the industrial sales section, with H. J. Hunkele as assistant.

★ **BERTIL E. ENGSTROM,** formerly with Minneapolis-Honeywell, joins the Darling Valve & Manufacturing Company, Williamsport, Pa., as midwest regional sales manager, in Chicago.

★ **AMEN!** "A conference is a gathering of important people who, singly, can do nothing, but together decide that nothing can be done."—*Fred Allen.*



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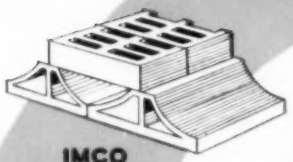

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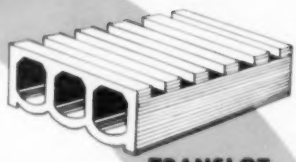

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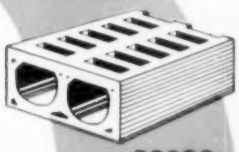

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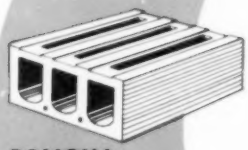

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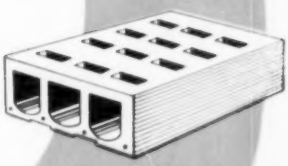

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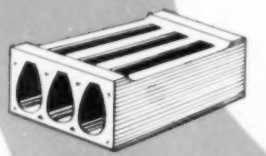

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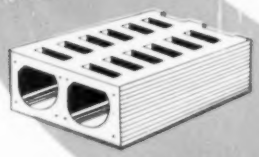

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Bowerston, Ohio

Industrial Materials Co.
Philadelphia 34, Pa.

Texas Vitrified Pipe Co.
Mineral Wells, Tex.

WHAT'S YOUR PLANT DOING ABOUT *Stream Pollution?*

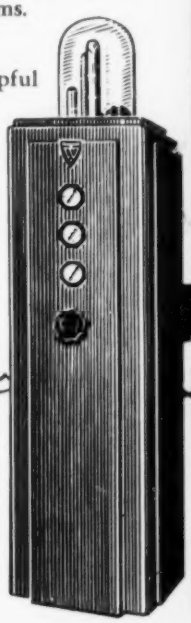
There's plenty that can be done to improve streams, restore recreational areas and multiply usable water sources. Sometimes it takes new or additional treatment works . . . but many, many cases can be solved or greatly improved with adequate effluent chlorination.

W&T offers the engineer and progressive sewage plant operator the tools to economically and effectively aid in the nation's pollution abatement program.

These tools consist of a full line of chlorinators, chemical feeding equipment and controls—over forty years of experience—and a field service staff to handle promptly all installation and equipment maintenance problems.

W&T Chlorinators, with manual, semi-automatic, automatic, or various types of rate and program control, are helpful in many other plant problems, too—such as grease removal, filter ponding prevention and septicity reduction, to mention just a few.

Why not start your community on the road to clean streams? Your W&T Representative will be glad to help, without obligation, of course.



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25 MAIN ST. BELLEVILLE 9. N. J.